



**Bay Engineering Inc.**  
Engineers, Planners and Surveyors

# **PRELIMINARY STORMWATER MANAGEMENT REPORT**

FOR

**BAY VILLAGE LOT 4  
TAX MAP 57A, GRID 14  
PARCEL 160, LOT 4  
ANNAPOLIS, MARYLAND**

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C/O GSX SOLUTIONS  
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DATE PREPARED: DECEMBER, 2015

Professional Certification. I hereby certify that these documents were prepared or approved by me,  
and that I am a duly licensed professional engineer under the laws of the state of Maryland.

License No: 19593, Expiration Date: 3/31/16



## TABLE OF CONTENTS

<u>Description</u>	<u>Page</u>
Introduction and Site History	1
Existing Conditions	1
Proposed Conditions	1
Methodology	3
Stormwater Management Note	3
Conclusions	4
Stormwater Management References	4
 <i>Appendix A – Environmental Site Design</i>	 5
• <i>Site Data</i>	
• <i>ESD Implementation Goals</i>	
• <i>ESD Implementation</i>	
• <i>SWM Requirements – CPV Requirement for the Lot 4</i>	
 <i>Appendix B – Pre-Development Flows</i>	 19
• <i>RCN Computations</i>	
• <i>Existing Conditions TR-55</i>	
• <i>Existing Flows to Pond/Inlet #25 – TR20</i>	
• <i>Determination of Allowable Flow from Pond</i>	
 <i>Appendix C – Post-Development Flows</i>	 45
• <i>RCN Computations</i>	
• <i>Developed Conditions TR-55</i>	
• <i>Reduced RCN for 10-year storm</i>	
• <i>Reduced RCN for 100-year storm</i>	
• <i>Developed Flows to Pond/Inlet #25 – TR20</i>	
 <i>Appendix D – Pond/Storage Trench Computations</i>	 74
• <i>Forebay Sizing</i>	
• <i>Permanent Pool Sizing</i>	
• <i>Channel Protection Volume Pond Computations</i>	
• <i>Stage Storage Computations</i>	
• <i>Stage Discharge Computations</i>	
• <i>Headwater/Tailwater Computations</i>	
• <i>100 year worst case Computations – TR20</i>	

<i>Appendix E – Wetland Computations*</i>	102
-------------------------------------------	-----

- *Existing Wetlands Storage Computations*
- *Existing Wetlands Discharge Computations*
- *Developed Wetlands Storage Computations*
- *Developed Wetlands Discharge Computations*

\*Refer to Drainage Area 1A discharge data in TR-20 computations in Appendix B and Appendix C for flows and water surface elevations for wetland area in pre and post development conditions.

<i>Appendix F – Storm Drain Computations</i>	107
----------------------------------------------	-----

- *Flow Tabulations – Lot 4*
- *Flow Tabulations – Updated Overall for Bay Village*
- *Flow Tabulations – Updated from Pond*

<i>Appendix G – As-Built Plans</i>	114
------------------------------------	-----

- *As-Built Storm Drain Plans for Arundel on the Bay Road*

<i>Appendix H – Geotechnical Report</i>	119
-----------------------------------------	-----

- *ECS Geotech Report*
- *O'Berry Engineering Geotech Investigation*

<i>Appendix I – Exhibits</i>	179
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- *ESD Drainage Area Map*
- *Pre-Development Drainage Area Map*
- *Post-Development Drainage Area Map*
- *Storm Drain Drainage Area map*

## **INTRODUCTION AND SITE HISTORY**

This report contains design information and calculations related to the proposed storm water management facilities associated with the development of Lot 4 of the Bay Village site.

The subject property is located on the south side of Bay Ridge Road at the intersection of Edgewood Road. Lot 4 is located at the back of the Bay Village site and is zoned R1.

The subject site is shown on Tax Map 57A, Parcel 160, Lot 4.

## **EXISTING CONDITIONS**

Soil types shown on the plans were obtained from the SCS Soil Survey for Anne Arundel County, Maryland. Hydrologic soil group C and D soils are present on-site according to the Soil Survey Map.

Lot 4 is approximately 6.30 acres. The existing site is primarily wooded with a stormwater management pond located on the east side of the lot. Drainage to and from Lot 4 ultimately drains to the existing stormwater management pond. The northern portion of Lot 4 is directed to the storm drain system in Bay Village Drive. The southern portion of Lot 4 drains to a low spot/wetland area which eventually makes it way to the pond.

## **PROPOSED CONDITIONS**

Under proposed conditions, Lot 4 will be developed into an Assisted Living facility. Parking will be located underneath the building. A Forest Conservation Area is proposed along part of the west and south end of the site. The drainage from the offsite area on the west and south will be collected into the proposed storm drain system and directed toward the underground stone/pipe trench and pond. ESD devices for Lot 4 will be provided around the proposed building. The existing pond will be modified and additional storage is provided in the proposed stone/pipe trench under the garage. Please note that there are some changes that occur within the road/R.O.W., but these changes actually produce an overall reduction in the existing impervious area (by 1580 sf) so additional WQV is not needed for the proposed work outside of Lot 4. It should also be noted that there is an existing bioretention area #4B adjacent to the existing pond which will be slightly modified with the pond changes. The lost water quality volume has been added to that which needs to be provided in the pond and is outlined in the pond design computations.

### **Stormwater Management Location and Design**

The site has been designed using Environmental Site Design ("ESD") to the maximum extent practicable ("MEP"). The site consists of a number of practices which provide a portion of the ESD volume around Lot 4. Because the target ESD for Lot 4 is not met, Channel protection volume is required for Lot 4.

Please note that the existing pond located on Lot 4 was constructed under the approved plans for Bay Village Lots 1 and 3. The approved design did not provide water quality volume for Lot 4. In addition, the pond was designed for Lot 4 in pre-development conditions. As a result, ESD volume for Lot 4 must be provided and the pond must be modified so that the additional flow from the development of Lot 4 does not increase the existing flow to existing Inlet #25. Please also note that updated topographical and hydrologic soils data have been applied to the entire drainage area to the pond (including that area outside of Lot 4) which accounts for the difference between the drainage area data in the previously approved plans and the drainage area data in this report. In the end, the most restrictive post development flow is actually that of the capacity of the existing downstream storm drain from the pond to existing Manhole #1 which connects just beyond Inlet #25.

Please note that consideration for the existing wetland has been provided with the supporting computations located on the pre-development and post-development drainage area plan sheets that breaks down the existing and developed flow to the wetland. The TR-20 runs have been modified to include the flow routing through the wetland and then on to the pond

#### **ESD BMP'S :**

##### **Micro-Scale Practices – Micro-Bioretention (M-6)**

Eight micro-bioretention areas are proposed on the site. Stormwater enters the micro-bioretention areas through storm drains directed to a gravel curtain at the micro-bioretention area or through sheet flow thru curb cuts to the micro-bioretention area.

An 'S' inlet has been provided in the micro-bioretention areas for conveyance of storms larger than the 1" storm. The micro-bioretention areas also include an underdrain system consisting of 6" perforated PVC pipe that is located within a gravel jacket layer beneath the planting soil. In some cases, recharge is provided in a gravel layer below the underdrain system.

##### **Structural Practice – Existing Pond**

The existing pond on Lot 4 has been modified to provide forest conservation area on Lot 4 to the maximum extent possible. The existing pond design provided water quality volume for the lots outside of Lot 4, channel protection volume, management of the 10 year storm and safe passage of the 100 year storm. The modified pond design, which decreases the size of the existing pond footprint, requires additional storage volume to maintain the intention of the original design and also provide the stormwater management requirements based on the development on Lot 4. As a result, the pond storage is supplemented by storage within the underground stone/pipe trench beneath the parking garage.

##### **Structural Practice – Underground Stone/Pipe Trench**

An underground stone/pipe trench is proposed under the garage to provide supplemental storage to the pond within the perforated pipe and stone. The trench is connected to the pond through two solid pipes. All of the pipes are at 0% slope at the same elevation as the pond bottom.

## **METHODOLOGY**

### **Stormwater Management Design**

The parameters used in the design of the SWM facilities are in accordance with the 2000 State Design Manual requirements.

### **STORMWATER MANAGEMENT NOTE**

Stormwater management for this site is provided in accordance with the MDE 2000 Maryland Stormwater Design Manual. This development is classified as new development given that the existing development occurs over less than 40% of the site. Stormwater management is provided for the site as follows:

- Lot 4 of Bay Village was designed in an effort to employ environmental site design (ESD) to the maximum extent practicable (MEP), and the site layout and grading minimizes disturbance to trees and wooded areas. Eight micro-bioretention areas are proposed throughout the site. The development of the site results in a target PE of 2.0 inches and an ESD volume of 11,761 cf. The ESD practices, used to the MEP, result in a treated PE of 1.1 inches and a provided ESD volume of 6,609 cf. Please note that the ESD volume for Lot 4 uses a total area based on the LOD on Lot 4, all within C soils.
- Since the ESD target volume was not met on-site using non-structural micro-practices, Channel Protection Volume is not required. A Channel Protection Volume of 10,498 cf is required. This volume is provided in the existing pond.
- Overbank Flood Protection, or management of the 10-year storm event, is required as to not exceed the existing flow from the site at existing inlet #25 downstream of the pond (35 cfs as indicated on as-built plans for the existing storm drain). In addition, the flow out of the pond cannot exceed the flow that can adequately be conveyed through the existing storm drain that runs from the pond to existing inlet 25 (22 cfs). The existing pond adequately manages the developed flow so that the flow at inlet #25 is 33 cfs and the flow out of the pond is 22 cfs.
- Extreme Flood Protection, or management of the 100-year storm event, is not required as safe passage of the 100 yr storm is provided through the pond.

## **CONCLUSIONS**

Based on the proposed ESD practices and the proposed improvements, it has been determined that this development will not have an adverse impact on downstream conditions.

A summary of the design requirements that have been provided follows:

### **STORMWATER MANAGEMENT SUMMARY TABLE:**

<b><u>Criteria</u></b>	<b><u>Required</u></b>	<b><u>Provided</u></b>	<b><u>Practice</u></b>
ESD <sub>v</sub>	Target P <sub>E</sub> = 2.0" Target ESD <sub>v</sub> = 11,761 cf	P <sub>E</sub> = 1.1" ESD <sub>v</sub> = 6,057 cf	<i>ESDv provided thru 8 Micro-Bioretention Areas,</i>
Cp <sub>v</sub>	10,498 cf	10,498 cf	<i>Provided in the pond.</i>
Q <sub>p10</sub>	Q <sub>10</sub> from pond not to exceed 22 cfs Q <sub>10</sub> to I#25 not to exceed 35 cfs	Q <sub>10</sub> from pond = 22 cfs Q <sub>10</sub> to I#25 = 33 cfs	<i>Provided in the pond.</i>
Q <sub>f</sub>	N/A	N/A	<i>Safe passage of the 100 year storm is provided</i>

### **STORMWATER MANAGEMENT REFERENCES**

1. Urban Hydrology for Small Watersheds, Technical Release No. 55, Version 2.00, Soil Conservation Service, U.S.D.A., Washington, D.C., February 1973.
2. Soil Survey for Anne Arundel County, Maryland, Soil Conservation Service, U.S.D.A., Washington, D.C., February 1973.
3. Engineering Field Manual, Soil Conservation Service, U.S.D.A., Washington, D.C., April 1975.
4. U.S. Weather Bureau Technical Paper 149, U.S. Weather Bureau, Washington, D.C.
5. 2000 Maryland Stormwater Design Manual Volumes I and II, Water Management Administration, 2000.

# **Appendix A**

# **Environmental Site Design**

**ANNE ARUNDEL COUNTY**  
**OFFICE OF PLANNING AND ZONING**  
**DEVELOPMENT DIVISION**

**Treatment:** ESD practices shall be used to treat the runoff from 1 inch of rainfall (i.e  $P_E = 1$  inch) on all new developments and redevelopments where stormwater management is required.  
 ESD practices shall be used to the MEP to address  $CP_V$  (i.e. treat the runoff from the 1-year 24-hour design storm) for 1-year post development peak discharge using the reduced RCN from Table 5.3

**INPUT DATA ONLY IN GREEN SHADED AREAS**

**Site Data:**

Site Location (County):	Dr. Bay Village Lot 4			
Site Area:	2.81	acres	Lot 4 L.O.D.	
Drainage Area:	2.81	acres		
Soils:	0%	A,	0%	B, 100% C, 0% D.
Impervious Area:	1.65	acres		

Site Soil Distribution					
HSG	AREA		RCN*	Percent	
A	Imp. Area	0.00	Acres	38	0%
	Tot. Area	0.00	Acres	38	0%
B	Imp. Area	0.00	Acres	55	0%
	Tot. Area	0.00	Acres	55	0%
C	Imp. Area	1.65	Acres	70	59%
	Tot. Area	2.81	Acres	70	100%
D	Imp. Area	0.00	Acres	77	0%
	Tot. Area	0.00	Acres	77	0%
Total Imp. Area		1.65	Acres		
Total Area		2.81	Acres		

\* RCN is for woods in good condition (Table 2-2, TR-55)

(Percent = (Imp. Area/ Tot. Area)\* 100)  
 (Percent = (Tot. Area/ Drainage Area)\* 100)  
 (Percent = (Imp. Area/ Tot. Area)\* 100)  
 (Percent = (Tot. Area/ Drainage Area)\* 100)  
 (Percent = (Imp. Area/ Tot. Area)\* 100)  
 (Percent = (Tot. Area/ Drainage Area)\* 100)  
 (Percent = (Imp. Area/ Tot. Area)\* 100)  
 (Percent = (Tot. Area/ Drainage Area)\* 100)

**ANNE ARUNDEL COUNTY**  
**OFFICE OF PLANNING AND ZONING**  
**DEVELOPMENT DIVISION**

**Step 1: Determine ESD Implementation Goals**

**A. Determine Pre-Developed Conditions**

. ***Soil Conditions and RCN for "woods in good condition".***

Site Soil Distribution		
HSG	RCN*	Area
A	n/a	0.00 acres
B	n/a	0.00 acres
C	70	2.81 acres
D	n/a	0.00 acres

\* RCN is for woods in good condition (Table 2-2, TR-55)

. ***Composite RCN for "woods in good condition".***

$$\text{RCN}_{\text{woods}} = \frac{(0 \times 0.0 \text{ acres}) + (0 \times 0.0 \text{ acres}) + (70 \times 2.8 \text{ acres}) + (0 \times 0.0 \text{ acres})}{2.8 \text{ acres}}$$

$$= 70$$

**The target RCN for "woods in good condition" is**

**70**

**B. Determine Target P<sub>E</sub> Using Table 5.3**

P<sub>E</sub> = Rainfall Target from Table 5.3 used to determine EAD goals and size practices.

NO NO

NO NO

NO NO

NO NO

55 60

NO NO

**55 60**

. **Determine % Impervious Area**

$$I = (\text{Imp. Area} / \text{Drainage Area})$$

$$I = (1.65 \text{ ac.} / 2.81 \text{ ac.})$$

$$I = 58.7 \% \quad \text{Based on entire DA}$$

CHECK BOTH 55% AND 60%, AND USE THE MOST CONSERVATIVE RESULT.

. **Determine P<sub>E</sub> form Table.**

Target PE		
HSG	PE for 55%	PE for 60%
A	n/a	"
B	n/a	"
C	1.8	2.0
D	n/a	"

**Target P<sub>E</sub> = 2.0 inches**

**C. Compute Q<sub>E</sub>**

Q<sub>E</sub> = Runoff depth in inches that must be treated using ESD Practices.

$$Q_E = P_E \times R_V$$

$$P_E = 2.0 \text{ inches}$$

$$R_V = 0.05 + (0.009)(I)$$

$$= 0.578$$

R<sub>V</sub> = the dimensionless volumetric runoff coefficient

$$Q_E = 2.0 \text{ inches} \times 0.58$$

**Q<sub>E</sub> = 1.16 inches**

### ESD Implementation

Development Bay Village Lot 4  
Location City of Annapolis  
Job No. 15-5208

Date 12/05/15  
Computed by JKC

#### ESD Implementation Goal Summary:

Total L.O.D. Lot 4 =	2.81	acres
Proposed Impervious Area within L.O.D.=	1.65	acres
Percent Impervious =	58.7	%
Rv=	0.58	
Target RCN =	70	
ESD Rainfall Target =	2.0	inches
Target Runoff Depth, $Q_E = P_E * R_v =$	1.16	inches
Target ESD volume, $ESD_V = P_E * R_v * A / 12 =$	0.27	acre-feet
=	11,761	cf
$WQV = 1.0 * R_v * A / 12 =$	0.140	acre-feet
=	6,098	cf
$ReV = (S)(Rv)(A)/12 =$	0.040	acre-feet
	1,742	cf

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#### Alternative Surfaces and Impact on ESD Targets:

None Proposed.

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#### Nonstructural Practices and Impact on ESD Targets:

None Proposed.

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Micro-Scale Practices and Impact on ESD Targets:

**Micro-Bioretention Areas**

**Micro-Bioretention Area '1' (Enhanced):**

Contributing Drainage Area =	10.201	sf
=	0.23	ac
Impervious Area =	7.880	sf
	0.18	ac
Percent impervious area =	77.2	%
Volumetric Runoff Coefficient, $R_v$ =	0.74	
Target $P_E$ =	2.00	inches
ESD <sub>v</sub> =	1258	cf
Maximum allowable ESD <sub>v</sub> (2.7") =	1698	cf
Minimum ESD <sub>v</sub> required * =	1258	cf
* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESD <sub>v</sub> .		
Proposed surface area, $A_l$ =	475	sf
Porosity of filter media =	0.4	
Depth of filter media =	48	inches
Ponding depth =	6	inches
Storage volume provided in microbioretention area =		
Ponding volume + volume in filter media =	998	cf
$A_l / DA$ =	0.05	(min. 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	10.201	100.0%
D	0.07	0	0.0%
Total		10.201	100.0%

S =	0.13	
Re <sub>v</sub> required =	0.002	ac-ft
=	82	cf
Minimum depth of enhanced feature to provide Re <sub>v</sub> =	0.43	ft
=	5.16	inches
Use depth =	12	inches
Storage volume provided in enhanced filter =	190	cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	56.00	55.00
Ponding Area	6	55.75	55.25
Mulch Layer	3	55.25	55.00
Planting Soil	48	55.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	15	50.67	49.42
Recharge	12	49.42	48.42

Total storage volume provided in microbioretention area =	1188	cf
WQ <sub>v</sub> provided in microbioretention area (1" storm) =	629	cf
Recharge volume provided in enhanced filter =	190	cf

<b>Total ESD<sub>v</sub> provided =</b>	1188	cf
<b><math>P_E</math> treatment provided =</b>	1.89	inches

<b>Actual Volume Provided =</b>	1188	cf
<b>Runoff treated within total storage =</b>	1.89	inches

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**Micro-Bioretention Area '2' (Enhanced):**

Contributing Drainage Area = 10,201 sf  
= 0.23 ac  
Impervious Area = 7,880 sf  
0.18 ac  
Percent impervious area = 77.2 %  
Volumetric Runoff Coefficient,  $R_v$  = 0.74  
Target  $P_E$  = 2.00 inches  
ESDv = 1258 cf  
Maximum allowable ESDv (2.7") = 1698 cf  
Minimum ESDv required \* = 1258 cf  
\* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESDv.  
Proposed surface area,  $A_t$  = 475 sf  
Porosity of filter media = 0.4  
Depth of filter media = 48 inches  
Ponding depth = 6 inches  
Storage volume provided in microbioretention area =  
Ponding volume + volume in filter media = 998 cf  
 $A_t / DA$  = 0.05 (min. 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	10,201	100.0%
D	0.07	0	0.0%
Total		10,201	100.0%

S = 0.13  
 $R_{e,v}$  required = 0.002 ac-ft  
= 82 cf  
Minimum depth of enhanced feature to provide  $R_{e,v}$  = 0.43 ft  
= 5.16 inches  
Use depth = 12 inches  
Storage volume provided in enhanced filter = 190 cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	56.00	55.00
Ponding Area	6	55.75	55.25
Mulch Layer	3	55.25	55.00
Planting Soil	48	55.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	15	50.67	49.42
Recharge	12	49.42	48.42

Total storage volume provided in microbioretention area = 1188 cf  
WQv provided in microbioretention area (1" storm) = 629 cf  
Recharge volume provided in enhanced filter = 190 cf  
  
**Total ESDv provided = 1188 cf**  
 **$P_E$  treatment provided = 1.89 inches**  
  
**Actual Volume Provided = 1188 cf**  
**Runoff treated within total storage = 1.89 inches**

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**Micro-Bioretention Area '3' (Enhanced):**

Contributing Drainage Area =	<b>9,393</b>	sf
=	0.22	ac
Impervious Area =	<b>7,217</b>	sf
	0.17	ac
Percent impervious area =	76.8	%
Volumetric Runoff Coefficient, $R_v$ =	0.74	
Target $P_E$ =	<b>2.00</b>	inches
ESD <sub>v</sub> =	1158	cf
Maximum allowable ESD <sub>v</sub> (2.7") =	<b>1564</b>	cf
Minimum ESD <sub>v</sub> required * =	<b>1158</b>	cf
* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESD <sub>v</sub> .		
Proposed surface area, $A_t$ =	<b>358</b>	sf
Porosity of filter media =	<b>0.4</b>	
Depth of filter media =	<b>48</b>	inches
Ponding depth =	<b>6</b>	inches
Storage volume provided in microbioretention area =		
Ponding volume + volume in filter media =	<b>752</b>	cf
$A_t / DA$ =	0.04	(min. 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	<b>0</b>	0.0%
B	0.26	<b>0</b>	0.0%
C	0.13	<b>9,393</b>	100.0%
D	0.07	<b>0</b>	0.0%
<i>Total</i>		9,393	100.0%

S =	0.13	
Re <sub>v</sub> required =	0.002	ac-ft
=	75	cf
Minimum depth of enhanced feature to provide Re <sub>v</sub> =	0.53	ft
=	6.31	inches
Use depth =	<b>12</b>	inches
Storage volume provided in enhanced filter =	<b>143</b>	cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	<b>56.00</b>	55.00
Ponding Area	6	55.75	55.25
Mulch Layer	3	55.25	55.00
Planting Soil	48	55.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	<b>15</b>	50.67	<b>49.42</b>
Recharge	12	49.42	48.42

Total storage volume provided in microbioretention area =	<b>895</b>	cf
WQ <sub>v</sub> provided in microbioretention area (1" storm) =	<b>579</b>	cf
Recharge volume provided in enhanced filter =	<b>143</b>	cf

<b>Total ESD<sub>v</sub> provided =</b>	<b>895</b>	cf
<b>P<sub>E</sub> treatment provided =</b>	<b>1.55</b>	inches

<b>Actual Volume Provided</b> =	<b>895</b>	cf
<b>Runoff treated within total storage</b> =	<b>1.55</b>	inches

**Micro-Bioretention Area '4' (Enhanced):**

Contributing Drainage Area =	9,393	sf
=	0.22	ac
Impervious Area =	7,217	sf
	0.17	ac
Percent impervious area =	76.8	%
Volumetric Runoff Coefficient, $R_v$ =	0.74	
Target $P_E$ =	2.00	inches
ESDv =	1158	cf
Maximum allowable ESD <sub>v</sub> (2.7') =	1564	cf
Minimum ESD <sub>v</sub> required * =	1158	cf
* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESDv.		
Proposed surface area, $A_t$ =	358	sf
Porosity of filter media =	0.4	
Depth of filter media =	48	inches
Ponding depth =	6	inches
Storage volume provided in microbioretention area =		
Ponding volume + volume in filter media =	752	cf
$A_t / DA$ =	0.04	(min. 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	9,393	100.0%
D	0.07	0	0.0%
<i>Total</i>		9,393	100.0%

$S =$	0.13	
$R_{ev}$ required =	0.002	ac-ft
=	75	cf
Minimum depth of enhanced feature to provide $R_{ev}$ =	0.53	ft
=	6.31	inches
Use depth =	12	inches
Storage volume provided in enhanced filter =	143	cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	56.00	55.00
Ponding Area	6	55.75	55.25
Mulch Layer	3	55.25	55.00
Planting Soil	48	55.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	15	50.67	49.42
Recharge	12	49.42	48.42

Total storage volume provided in microbioretention area =	895	cf
WQv provided in microbioretention area (1" storm) =	579	cf
Recharge volume provided in enhanced filter =	143	cf
<b>Total ESDv provided =</b>	<b>895</b>	<b>cf</b>
<b><math>P_E</math> treatment provided =</b>	<b>1.55</b>	<b>inches</b>
<b>Actual Volume Provided =</b>	<b>895</b>	<b>cf</b>
<b>Runoff treated within total storage =</b>	<b>1.55</b>	<b>inches</b>

**Micro-Bioretention Area '5' (Enhanced):**

Contributing Drainage Area =	<b>8,052</b>	sf
=	0.18	ac
Impervious Area =	<b>6,342</b>	sf
	0.15	ac
Percent impervious area =	78.8	%
Volumetric Runoff Coefficient, $R_v$ =	0.76	
Target $P_E$ =	<b>2.00</b>	inches
ESD <sub>v</sub> =	1020	cf
Maximum allowable ESD <sub>v</sub> (2.7") =	1377	cf
Minimum ESD <sub>v</sub> required * =	1020	cf
* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESD <sub>v</sub> .		
Proposed surface area, $A_t$ =	<b>263</b>	sf
Porosity of filter media =	0.4	
Depth of filter media =	<b>48</b>	inches
Ponding depth =	<b>6</b>	inches
Storage volume provided in microbioretention area =		
Ponding volume + volume in filter media =	<b>552</b>	cf
$A_t / DA$ =	0.03	(min, 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	<b>8,052</b>	100.0%
D	0.07	0	0.0%
Total		8,052	100.0%

S =	0.13	
$R_{v, \text{required}}$ =	0.002	ac-ft
=	66	cf
Minimum depth of enhanced feature to provide $R_{v, \text{required}}$ =	0.63	ft
=	7.56	inches
Use depth =	<b>12</b>	inches
Storage volume provided in enhanced filter =	105	cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	<b>56.00</b>	55.00
Ponding Area	6	55.75	55.25
Mulch Layer	3	55.25	55.00
Planting Soil	48	55.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	<b>15</b>	50.67	49.42
Recharge	12	49.42	48.42

Total storage volume provided in microbioretention area =	<b>657</b>	cf
WQ <sub>v</sub> provided in microbioretention area (1" storm) =	<b>510</b>	cf
Recharge volume provided in enhanced filter =	105	cf
Total ESD <sub>v</sub> provided =	<b>657</b>	cf
$P_E$ treatment provided =	<b>1.29</b>	inches
Actual Volume Provided =	<b>657</b>	cf
Runoff treated within total storage =	<b>1.29</b>	inches

**Micro-Bioretention Area '6' (Enhanced):**

Contributing Drainage Area = 3,732 sf

= 0.09 ac

Impervious Area = 2,670 sf

= 0.06 ac

Percent impervious area = 71.5 %

Volumetric Runoff Coefficient,  $R_v$  = 0.69

Target  $P_E$  = 2.00 inches

ESDv = 429 cf

Maximum allowable ESDv (2.7") = 579 cf

Minimum ESDv required \* = 429 cf

\* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESDv.

Proposed surface area,  $A_t$  = 256 sf

Porosity of filter media = 0.4

Depth of filter media = 36 inches

Ponding depth = 6 inches

Storage volume provided in microbioretention area =

Ponding volume + volume in filter media = 435 cf

$A_t / DA$  = 0.07 (min. 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	3,732	100.0%
D	0.07	0	0.0%
Total		3,732	100.0%

S = 0.13

$Re_v$  required = 0.001 ac-ft

= 28 cf

Minimum depth of enhanced feature to provide  $Re_v$  = 0.27 ft

= 3.27 inches

Use depth = 0 inches

Storage volume provided in enhanced filter = 0 cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	55.00	54.00
Ponding Area	6	54.75	54.25
Mulch Layer	3	54.25	54.00
Planting Soil	36	54.00	51.00
Gravel Layer	4	51.00	50.67
Gravel Jacket	15	50.67	49.42
Recharge	0	49.42	49.42

Total storage volume provided in microbioretention area = 435 cf

WQv provided in microbioretention area (1" storm) = 215 cf

Recharge volume provided in enhanced filter = 0 cf

Total ESDv provided = 435 cf

$P_E$  treatment provided = 2.03 inches

Actual Volume Provided = 435 cf

Runoff treated within total storage = 2.03 inches

**Micro-Bioretention Area 7' (Enhanced):**

Contributing Drainage Area =	4,766	sf
=	0.11	ac
Impervious Area =	3,211	sf
	0.07	ac
Percent impervious area =	67.4	%
Volumetric Runoff Coefficient, $R_v$ =	0.66	
Target $P_E$ =	2.00	inches
ESDv =	524	cf
Maximum allowable ESD <sub>v</sub> (2.7') =	708	cf
Minimum ESD <sub>v</sub> required * =	524	cf
* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESDv.		
Proposed surface area, $A_i$ =	498	sf
Porosity of filter media =	0.4	
Depth of filter media =	27	inches
Ponding depth =	6	inches
Storage volume provided in microbioretention area =		
Ponding volume + volume in filter media =	697	cf
$A_i / DA$ =	0.10	(min. 0.02 required)

HSG	Recharge	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	4,766	100.0%
D	0.07	0	0.0%
Total		4,766	100.0%

$S$ =	0.13	
$Re_v$ required =	0.001	ac-ft
=	34	cf
Minimum depth of enhanced feature to provide $Re_v$ =	0.17	ft
=	2.05	inches
Use depth =	0	inches
Storage volume provided in enhanced filter =	0	cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	54.00	53.00
Ponding Area	6	53.75	53.25
Mulch Layer	3	53.25	53.00
Planting Soil	27	53.00	50.75
Gravel Layer	4	50.75	50.42
Gravel Jacket	15	50.42	49.17
Recharge	0	49.17	49.17

Total storage volume provided in microbioretention area =	697	cf
WQv provided in microbioretention area (1" storm) =	262	cf
Recharge volume provided in enhanced filter =	0	cf
Total ESDv provided =	697	cf
$P_E$ treatment provided =	2.66	inches
Actual Volume Provided =	697	cf
Runoff treated within total storage =	2.66	inches

**Micro-Bioretention Area '8' (Enhanced):**

Contributing Drainage Area = **6,446** sf  
 = 0.15 ac  
 Impervious Area = **4,455** sf  
 = 0.10 ac  
 Percent impervious area = 69.1 %  
 Volumetric Runoff Coefficient,  $R_v$  = 0.67

Target  $P_E$  = **2.00** inches  
 ESDv = 720 cf  
 Maximum allowable ESDv (2.7') = 972 cf  
 Minimum ESDv required \* = 720 cf

\* The more conservative value of either the storage associated with the 1" storm or at least 75% of the ESDv.

Proposed surface area,  $A_t$  = **333** sf  
 Porosity of filter media = 0.4  
 Depth of filter media = 32 inches  
 Ponding depth = 6 inches

Storage volume provided in microbioretention area =  
 Ponding volume + volume in filter media = 521 cf  
 $A_t / DA$  = 0.05 (min, 0.02 required)

HSG	Recharge Factor	Area (sf)	%
A	0.38	0	0.0%
B	0.26	0	0.0%
C	0.13	<b>6,446</b>	100.0%
D	0.07	0	0.0%
Total		6,446	100.0%

S = 0.13  
 $R_{v, \text{required}}$  = 0.001 ac-ft  
 = 47 cf  
 Minimum depth of enhanced feature to provide  $R_{v, \text{required}}$  = 0.35 ft  
 = 4.22 inches  
 Use depth = 12 inches  
 Storage volume provided in enhanced filter = 133 cf

**Facility Summary:**

Component	Thickness (inches)	Top Elevation	Bottom Elevation
Pea Gravel	12	<b>49.00</b>	48.00
Ponding Area	6	48.75	48.25
Mulch Layer	3	48.25	48.00
Planting Soil	32	48.00	45.34
Gravel Layer	4	45.34	45.01
Gravel Jacket	15	45.01	43.76
Recharge	12	43.76	42.76

Total storage volume provided in microbioretention area = 654 cf  
 WQv provided in microbioretention area (1" storm) = 360 cf  
 Recharge volume provided in enhanced filter = 133 cf

Total ESDv provided = **654** cf  
 $P_E$  treatment provided = **1.82** inches

Actual Volume Provided = **654** cf  
 Runoff treated within total storage = **1.82** inches

**Summary of ESD Volume**

Drainage Area	ESD Practice	Area Treated (sf)	Total ESD <sub>v</sub> Provided (cf)	P <sub>E</sub> Treated (inches)	Actual Volume Provided (cf)
MB1	Micro-bio area	10,201	1,188	1.89	1,188
MB2	Micro-bio area	10,201	1,188	1.89	1,188
MB3	Micro-bio area	9,393	895	1.55	895
MB4	Micro-bio area	9,393	895	1.55	895
MB5	Micro-bio area	8,052	657	1.29	657
MB6	Micro-bio area	3,732	435	2.03	435
MB7	Micro-bio area	4,766	697	2.66	697
MB8	Micro-bio area	6,446	654	1.82	654
<b>Total</b>			<b>6,609</b>	<b>1.1</b>	6,609
<i>Required</i>			11,761	2.0	

**ANNE ARUNDEL COUNTY**  
**OFFICE OF PLANNING AND ZONING**  
**DEVELOPMENT DIVISION**

**SWM Requirements After Using ESD**

**A. Calculate Reduced RCN's**

. Determine Reduced RCN for  $P_E$  after ESD Implementation

$P_E = \underline{\underline{1.00}}$  inches (Rainfall used to size ESD practices)

**ADDITIONAL CPV STORAGE VOLUME REQUIRED**

Enter reduced RCN based on  $P_E$  after ESD Implementation and enter below

Reduced RCN				
HSG		I=55%	I=60%	USE
A	0.00	n/a	n/a	0
B	0.00	n/a	n/a	0
C	2.81	78	80	80
D	0.00	n/a	n/a	0

Composite RCN = 80       $\longrightarrow$  USE RCN OF 80

**B. Calculate  $Cp_v$  Requirements**

- . Composite RCN for "woods in good condition" is 71
- . The Reduced RCN after implementing ESD's is 80

When  $P_E \geq 1.0$  inches,  $Cp_v$  shall be the runoff from 1-year 24-hour design storm calculated using the reduced RCN. If the reduced RCN for a drainage area reflects "woods in good condition", then  $Cp_v$  has been satisfied for that drainage area.

Calculate  $Cp_v$  using design  $P_E = 1.0$  inches ( $RCN = 80$ ):

$$Cp_v = Q_1 \times A$$

where:  $Q_1$  is the runoff from the 1-year 24-hour design storm

$$Q_1 = \frac{(P-0.2S)^2}{(P+0.8S)} \quad (\text{Equation 2.3, TR-55, USDA, NRCS 1986})$$

where:  $P = 1\text{-year 24 hour design storm}$

$P = \underline{\underline{2.7}}$  inches

$S = (1000/RCN) - 10$

$= (1000/80) - 10$

$= 2.5$

$$Q_1 = \frac{[2.7 - (0.2 \times 2.5)]^2}{[2.7 + (0.8 \times 2.5)]} = \frac{4.84}{4.7} = 1.03 \text{ inches}$$

$$\begin{aligned} Cp_v &= 1.03 \text{ inches} \times 2.8 \text{ acres} \\ &= 0.241 \text{ ac.ft.} \quad \text{or} \quad 10,498 \text{ cubic feet} \end{aligned}$$

Cpv Storage Requirements			
Rainfal ( $P_E$ )	Additional $Cp_v$ Req.		Notes:
	(ac.-ft.)	(cu.ft.)	
$P_E \geq 2.0$ inches	n/a	n/a	Target $P_E$ for $RCN=$ Woods
$P_E = 1.0$ inches	0.241	10,498	Design $P_E$

# **Appendix B**

# **Pre-Development Flows**

**RCN VALUE CALCULATIONS  
FOR SWM  
EXISTING CONDITIONS**

<b>Development</b>	<u>Bay Village Drive</u>	<b>Date</b>	<u>12/06/15</u>
<b>Location</b>	<u>City of Annapolis</u>	<b>Computed by</b>	<u>JC</u>
<b>Job No.</b>	<u>05-1500</u>		

**Drainage Area 1A (to existing wetland onsite and then to pond)**

**Onsite**

pervious area = (modeled as woods - C soils)	2.19 acres	RCN = 70
-------------------------------------------------	------------	----------

**Offsite**

impervious area ( C soils) =	0.73 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	2.42 acres	RCN = 74
------------------------------------------------	------------	----------

pervious area = (modeled as woods - C soils)	3.55 acres	RCN = 70
-------------------------------------------------	------------	----------

impervious area ( D soils) =	0.35 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - D soils)	0.73 acres	RCN = 80
------------------------------------------------	------------	----------

pervious area = (modeled as woods - D soils)	2.02 acres	RCN = 77
-------------------------------------------------	------------	----------

<b>Total Area =</b>	<b>11.99 acres</b>
<b>Weighted RCN =</b>	<b>75</b>

**Drainage Area 1B (to pond)**

**Offsite (from Samaras site west of Bay Village Site)**

impervious area ( C soils) =	0.86 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	1.45 acres	RCN = 74
------------------------------------------------	------------	----------

pervious area = (modeled as woods - C soils)	2.17 acres	RCN = 70
-------------------------------------------------	------------	----------

impervious area ( D soils) =	0.87 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - D soils)	0.44 acres	RCN = 80
------------------------------------------------	------------	----------

pervious area = (modeled as woods - D soils)	0.28 acres	RCN = 77
-------------------------------------------------	------------	----------

**Offsite (from east of Bay Village Site)**

pervious area = (modeled as woods - C soils)	0.46 acres	RCN = 70
-------------------------------------------------	------------	----------

**Offsite (from south of Bay Village Site)**

impervious area ( C soils) =	0.00 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.00 acres	RCN = 74
------------------------------------------------	------------	----------

pervious area = (modeled as woods - C soils)	0.00 acres	RCN = 70
-------------------------------------------------	------------	----------

**Bay Village Site (Lot 1) (taken from approved plans and computations)**

impervious area ( C soils) =	0.59 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.37 acres	RCN = 74
------------------------------------------------	------------	----------

**Bay Village Site (Lot 2) (assumed future development of 85% impervious)**

impervious area ( C soils) =	0.43 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.08 acres	RCN = 74
------------------------------------------------	------------	----------

**Bay Village Site (Lot 3) (taken from approved plans and computations)**

impervious area ( C soils) =	1.16 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.21 acres	RCN = 74
------------------------------------------------	------------	----------

impervious area ( D soils) =	0.01 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - D soils)	0.02 acres	RCN = 80
------------------------------------------------	------------	----------

**Bay Village Site (R.O.W.) (taken from approved plans and computations)**

impervious area ( C soils) =	0.75 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.25 acres	RCN = 74
------------------------------------------------	------------	----------

**Offsite Area Between Lots 2 and 3**

impervious area ( C soils) =	0.23 acres	RCN = 98
------------------------------	------------	----------

pervious area = (modeled as lawn - C soils)	0.17 acres	RCN = 74
------------------------------------------------	------------	----------

**Bay Village Site (Existing Lot 4)**

impervious area ( C soils) =	0.26 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	1.33 acres	RCN = 74
pervious area = (modeled as woods - C soils)	2.09 acres	RCN = 70
pervious area = (modeled as lawn - D soils)	0.43 acres	RCN = 80
<b>Total Area =</b> <b>Weighted RCN =</b>	<b>14.91 acres</b> <b>81</b>	

#### **Bypass Area to Inlet #25**

impervious area =	1.01 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	1.39 acres	RCN = 74
pervious area = (modeled as woods - C soils)	0.91 acres	RCN = 70
pervious area = (modeled as lawn - D soils)	0.58 acres	RCN = 80
pervious area = (modeled as woods - D soils)	0.37 acres	RCN = 77
<b>Total Area =</b> <b>Weighted RCN =</b>	<b>4.26 acres</b> <b>80</b>	

BVEX1A.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: EXISTING FLOW TO WETLAND DA #1A

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	3.3	67	.30	F					0.058
Sheet		33	.039	F					0.074
Shallow Concent'd		38	.078	U					0.002
Shallow Concent'd		937	.008	U					0.180
								Time of Concentration =	0.31*
								=====	

--- Sheet Flow Surface Codes ---		--- Shallow Concentrated ---	
A Smooth Surface	F Grass, Dense		
B Fallow (No Res.)	G Grass, Burmuda		Surface Codes
C Cultivated < 20 % Res.	H Woods, Light		P Paved
D Cultivated > 20 % Res.	I Woods, Dense		U Unpaved
E Grass-Range, Short	J Range, Natural		

\* - Generated for use by GRAPHIC method

† GRAPHICAL PEAK DISCHARGE METHOD

Version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: EXISTING FLOW TO WETLAND DA #1A

Data: Drainage Area : 12 Acres  
 Runoff Curve Number : 75  
 Time of Concentration: 0.31 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.25	0.20	0.16	0.13	0.11	0.10	0.09
Used	0.25	0.20	0.16	0.13	0.11	0.10	0.10
Runoff (in)	0.77	1.16	1.89	2.61	3.20	3.71	4.50
Unit Peak Discharge (cfs/acre/in)	0.924	0.960	0.997	1.019	1.031	1.039	1.041
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	9	13	23	32	40	46	56

\* - value(s) provided from TR-55 system routines

BVEX1B.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: EXISTING DRAINAGE AREA #1B

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	3.3	64	.063	F					0.104
Sheet		36	.10	F					0.054
Shallow Concent'd		810	.017	U					0.107
Open Channel		692						3.5	0.055
									Time of Concentration = 0.32*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface	F Grass, Dense	--- Shallow Concentrated ---
B Fallow (No Res.)	G Grass, Burmuda	--- Surface Codes ---
C Cultivated < 20 % Res.	H Woods, Light	P Paved
D Cultivated > 20 % Res.	I Woods, Dense	U Unpaved
E Grass-Range, Short	J Range, Natural	

\* - Generated for use by GRAPHIC method

† GRAPHICAL PEAK DISCHARGE METHOD

version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: EXISTING DRAINAGE AREA #1B

Data: Drainage Area : 14.9 Acres  
 Runoff Curve Number : 81  
 Time of Concentration: 0.32 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.17	0.14	0.11	0.09	0.08	0.07	0.06
Used	0.17	0.14	0.11	0.10	0.10	0.10	0.10
Runoff (in)	1.09	1.55	2.38	3.16	3.79	4.34	5.18
Unit Peak Discharge (cfs/acre/in)	0.968	0.993	1.019	1.026	1.026	1.026	1.026
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	16	23	36	48	58	66	79

\* - value(s) provided from TR-55 system routines

BVBYP.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: BYPASS AREA TO INLET 25

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	3.3	100	.05	H					0.244
Shallow Concent'd		194	.10	U					0.011
Shallow Concent'd		464	.02	U					0.056
Time of Concentration = 0.31*									=====

--- Sheet Flow Surface Codes ---		--- Shallow Concentrated Surface Codes ---	
A Smooth Surface	F Grass, Dense		
B Fallow (No Res.)	G Grass, Burmuda		
C Cultivated < 20 % Res.	H Woods, Light		P Paved
D Cultivated > 20 % Res.	I Woods, Dense		U Unpaved
E Grass-Range, Short	J Range, Natural		

\* - Generated for use by GRAPHIC method

♀ GRAPHICAL PEAK DISCHARGE METHOD

Version 2.10

Project : BAY VILLAGE LOT 4 User: JKC Date: 07-06-2015  
 County : ANNE ARUNDEL State: MD Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: BYPASS AREA TO INLET 25

Data: Drainage Area : 4.26 Acres  
 Runoff Curve Number : 80  
 Time of Concentration: 0.31 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.19	0.15	0.12	0.10	0.08	0.08	0.07
Used	0.19	0.15	0.12	0.10	0.10	0.10	0.10
Runoff (in)	1.03	1.48	2.29	3.07	3.69	4.24	5.06
Unit Peak Discharge (cfs/acre/in)	0.973	1.000	1.028	1.041	1.041	1.041	1.041
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	4	6	10	14	16	19	22

\* - value(s) provided from TR-55 system routines

♀

BVEXWP2.OUT

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\*\*\*\*\*80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY\*\*\*\*\*

JOB TR-20 001				SUMMARY	NO PLOTS
TITLE	PROJECT:	JKC		BY:JC	
TITLE	FILENAME:	DATE: 12-3-15			
3 STRUCT	01	BVexwp.DAT			
8		51.5	0.000	0.000	
8		51.6	7.680	0.306	
8		51.8	48.15	0.944	
8		52.0	113.3	1.619	
8					
9 ENDTBL					
3 STRUCT	02				
8		37.6	0.000	0.000	
8		37.7	0.001	0.001	
8		38.0	0.154	0.037	
8		39.0	0.341	0.306	
8		40.0	0.456	0.624	
8		40.6	0.513	0.839	
8		41.0	0.548	0.993	
8		42.0	3.508	1.411	
8		43.0	13.17	1.882	
8		44.0	21.52	2.406	
8		45.0	24.16	2.983	
8		46.0	25.04	3.743	
8		47.0	25.94	4.434	
8		48.0	26.86	5.182	
8					
9 ENDTBL					
6 RUNOFF	1 001	1 0.019	75.0	0.31	1 1 1 1 1 1 DA#1A
6 RESVOR	2 01 1	2 51.5			1 1 1 1 1 1 wetland
6 RUNOFF	1 002	3 0.0233	81.0	0.32	1 1 1 1 1 1 DA#1B
6 ADDHYD	4 003 2 3 4				1 1 1 1 1 1 #1A+#1B
6 RESVOR	2 02 4	5 37.6			1 1 1 1 1 1 EX POND
6 RUNOFF	1 004	6 0.0067	80.0	0.31	1 1 1 1 1 1 DABYP#1
6 ADDHYD	4 005 5 6 7				1 1 1 1 1 1 #1+BYP
ENDATA					
7 INCREM	6	0.05			
7 COMPUT	7 001 005	0.00	5.2	1.00	2 2 1 10
	ENDCMP 1				
7 COMPUT	7 001 005	0.00	7.4	1.00	2 2 1 99
	ENDCMP 1				
	ENDJOB 2				

\*\*\*\*\*END OF 80-80 LIST\*\*\*\*\*

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TR20	-----	-----	SCS -
001	PROJECT: JKC	DATE: 12-3-15	BY: JC
12/03/**	FILENAME: BVexwp.DAT		VERSION
11:34:42	PASS 1	JOB NO. 1	2.04TEST
			PAGE 1

EXECUTIVE CONTROL INCREM MAIN TIME INCREMENT = .050 HOURS

EXECUTIVE CONTROL COMPUT	FROM XSECTION 1 TO XSECTION 5	
STARTING TIME = .00	RAIN DEPTH = 5.20	RAIN DURATION = 1.00
ANT. RUNOFF COND. = 2	MAIN TIME INCREMENT = .050 HOURS	
	Page 1	

ALTERNATE NO. = 1

BVEXWP2.OUT  
STORM NO. =10

RAIN TABLE NO. = 2

OPERATION RUNOFF XSECTION 1

PEAK TIME(HRS) 12.08 PEAK DISCHARGE(CFS) 34.8 PEAK ELEVATION(FEET)  
(RUNOFF)

HRS	MAIN	HYDROGRAPH POINTS FOR			ALTERNATE = 1,	DRAINAGE AREA =	STORM =10	.02 SQ.MI.	
		TIME	INCREMENT =	.050 hr,					
10.45	CFS	.48	.51	.54	.57	.61	.64	.68	.73
10.85	CFS	.77	.82	.87	.93	.99	1.05	1.12	1.20
11.25	CFS	1.29	1.40	1.51	1.63	1.77	1.92	2.14	2.52
11.65	CFS	3.23	4.46	6.35	9.05	12.86	18.18	24.61	30.53
12.05	CFS	34.17	34.48	31.06	25.89	20.75	16.45	13.30	11.14
12.45	CFS	9.50	8.22	7.19	6.35	5.69	5.15	4.72	4.38
12.85	CFS	4.11	3.89	3.71	3.55	3.42	3.29	3.18	3.07
13.25	CFS	2.98	2.89	2.82	2.74	2.67	2.60	2.54	2.47
13.65	CFS	2.41	2.35	2.30	2.24	2.19	2.14	2.09	2.05
14.05	CFS	2.00	1.95	1.91	1.88	1.84	1.82	1.79	1.77
14.45	CFS	1.75	1.74	1.72	1.70	1.69	1.67	1.65	1.64
14.85	CFS	1.62	1.60	1.59	1.57	1.55	1.54	1.52	1.51
15.25	CFS	1.49	1.47	1.46	1.44	1.42	1.41	1.39	1.37
15.65	CFS	1.36	1.34	1.32	1.31	1.29	1.27	1.26	1.24
16.05	CFS	1.22	1.21	1.19	1.18	1.17	1.16	1.15	1.14
16.45	CFS	1.13	1.13	1.12	1.11	1.11	1.10	1.10	1.09
16.85	CFS	1.08	1.08	1.07	1.07	1.06	1.06	1.05	1.04
17.25	CFS	1.04	1.03	1.03	1.02	1.01	1.01	1.00	1.00
17.65	CFS	.99	.98	.98	.97	.97	.96	.95	.95
18.05	CFS	.94	.94	.93	.92	.92	.91	.90	.90
18.45	CFS	.89	.89	.88	.87	.87	.86	.86	.85
18.85	CFS	.84	.84	.83	.83	.82	.81	.81	.80
19.25	CFS	.79	.79	.78	.78	.77	.76	.76	.75
19.65	CFS	.74	.74	.73	.73	.72	.71	.71	.70
20.05	CFS	.69	.69	.68	.68	.67	.67	.67	.67
20.45	CFS	.67	.66	.66	.66	.66	.66	.66	.66
20.85	CFS	.66	.65	.65	.65	.65	.65	.65	.65
21.25	CFS	.65	.65	.64	.64	.64	.64	.64	.64
21.65	CFS	.64	.64	.63	.63	.63	.63	.63	.63
22.05	CFS	.63	.63	.63	.62	.62	.62	.62	.62
22.45	CFS	.62	.62	.62	.61	.61	.61	.61	.61
22.85	CFS	.61	.61	.61	.61	.60	.60	.60	.60
23.25	CFS	.60	.60	.60	.60	.59	.59	.59	.59

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 PASS 1 JOB NO. 1 PAGE 2

23.65 CFS	.59	.59	.59	.59	.58	.58	.58	.58
24.05 CFS	.57	.52	.43					

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 2.61 WATERSHED INCHES; 32 CFS-HRS; 2.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14
FLOW(CFS)	2	1	1	1	1	1	0

--- XSECTION 1, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 1

## BVEXWP2.OUT

PEAK TIME(HRS)  
12.22PEAK DISCHARGE(CFS)  
23.9PEAK ELEVATION(FEET)  
51.68

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10  
HRS MAIN TIME INCREMENT = .050 hr, DRAINAGE AREA = .02 SQ.MI.

HRS	CFS	.00	.01	.01	.01	.02	.02	.03	.03
8.75	CFS	.00	.01	.01	.01	.02	.02	.03	.03
9.15	CFS	.04	.04	.05	.06	.06	.07	.08	.09
9.55	CFS	.09	.10	.11	.12	.13	.14	.15	.16
9.95	CFS	.17	.18	.19	.20	.21	.23	.24	.26
10.35	CFS	.27	.29	.31	.33	.35	.37	.39	.41
10.75	CFS	.44	.46	.49	.52	.55	.59	.62	.66
11.15	CFS	.70	.75	.80	.85	.91	.98	1.05	1.13
11.55	CFS	1.22	1.33	1.48	1.71	2.08	2.63	3.45	4.64
11.95	CFS	6.29	9.35	14.68	19.23	22.37	23.78	23.68	22.50
12.35	CFS	20.73	18.76	16.80	14.96	13.28	11.77	10.44	9.28
12.75	CFS	8.27	7.56	7.24	6.92	6.61	6.32	6.04	5.77
13.15	CFS	5.52	5.29	5.06	4.85	4.66	4.47	4.30	4.13
13.55	CFS	3.98	3.83	3.70	3.57	3.44	3.33	3.22	3.12
13.95	CFS	3.02	2.92	2.83	2.75	2.67	2.59	2.52	2.45
14.35	CFS	2.39	2.33	2.27	2.22	2.17	2.13	2.08	2.04
14.75	CFS	2.01	1.97	1.94	1.90	1.87	1.85	1.82	1.79
15.15	CFS	1.76	1.74	1.72	1.69	1.67	1.65	1.63	1.61
15.55	CFS	1.59	1.57	1.55	1.53	1.51	1.49	1.47	1.45
15.95	CFS	1.43	1.41	1.40	1.38	1.36	1.34	1.33	1.31
16.35	CFS	1.29	1.28	1.27	1.25	1.24	1.23	1.22	1.21
16.75	CFS	1.19	1.18	1.18	1.17	1.16	1.15	1.14	1.13
17.15	CFS	1.12	1.12	1.11	1.10	1.09	1.09	1.08	1.07
17.55	CFS	1.07	1.06	1.05	1.05	1.04	1.03	1.03	1.02
17.95	CFS	1.01	1.01	1.00	1.00	.99	.98	.98	.97
18.35	CFS	.96	.96	.95	.95	.94	.93	.93	.92
18.75	CFS	.92	.91	.90	.90	.89	.88	.88	.87
19.15	CFS	.87	.86	.85	.85	.84	.84	.83	.82
19.55	CFS	.82	.81	.80	.80	.79	.79	.78	.77
19.95	CFS	.77	.76	.75	.75	.74	.74	.73	.72
20.35	CFS	.72	.71	.71	.71	.70	.70	.69	.69
20.75	CFS	.69	.68	.68	.68	.68	.67	.67	.67
21.15	CFS	.67	.67	.66	.66	.66	.66	.66	.66

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TR20 ----- SCS -  
001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
12/03/\*\* FILENAME: Bvexwp.DAT 2.04TEST  
11:34:42 PASS 1 JOB NO. 1 PAGE 3

21.55	CFS	.65	.65	.65	.65	.65	.65	.65	.64
21.95	CFS	.64	.64	.64	.64	.64	.64	.64	.63
22.35	CFS	.63	.63	.63	.63	.63	.63	.63	.62
22.75	CFS	.62	.62	.62	.62	.62	.62	.62	.61
23.15	CFS	.61	.61	.61	.61	.61	.61	.61	.60
23.55	CFS	.60	.60	.60	.60	.60	.60	.60	.59
23.95	CFS	.59	.59	.59	.59	.57	.56	.53	.50
24.35	CFS	.46	.42	.39	.35	.32	.29	.26	.24
24.75	CFS	.22	.19	.17	.16	.14	.13	.12	.10
25.15	CFS	.09	.08	.08	.07	.06	.06	.05	.05
25.55	CFS	.04	.04	.03	.03	.03	.02	.02	.02
25.95	CFS	.02	.02	.01	.01	.01	.01		

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
2.61 WATERSHED INCHES; 32 CFS-HRS; 2.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	13
FLOW(CFS)	3	2	1	1	1	1	0

## BVEXWP2.OUT

--- STRUCTURE 1, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 2

PEAK TIME(HRS)		PEAK DISCHARGE(CFS)			PEAK ELEVATION(FEET) (RUNOFF)		
	12.08		51.0				
HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10							
HRS	MAIN TIME INCREMENT =	.050 hr,	DRAINAGE AREA =	.02	SQ.MI.		
9.15 CFS	.49	.50	.52	.53	.55	.56	.57 .59
9.55 CFS	.60	.61	.63	.64	.66	.69	.71 .74
9.95 CFS	.77	.80	.83	.86	.89	.93	.97 1.01
10.35 CFS	1.06	1.10	1.15	1.20	1.25	1.31	1.37 1.43
10.75 CFS	1.50	1.57	1.65	1.74	1.82	1.91	2.01 2.11
11.15 CFS	2.23	2.36	2.51	2.68	2.87	3.08	3.29 3.53
11.55 CFS	3.88	4.52	5.67	7.54	10.41	14.47	20.17 27.77
11.95 CFS	36.75	45.22	50.35	50.51	45.79	38.44	30.89 24.39
12.35 CFS	19.73	16.44	13.93	11.97	10.42	9.15	8.15 7.35
12.75 CFS	6.71	6.20	5.79	5.45	5.18	4.95	4.75 4.56
13.15 CFS	4.40	4.25	4.12	4.00	3.88	3.78	3.68 3.58
13.55 CFS	3.49	3.40	3.31	3.23	3.15	3.08	3.01 2.94
13.95 CFS	2.87	2.80	2.74	2.68	2.62	2.57	2.52 2.48
14.35 CFS	2.45	2.42	2.39	2.37	2.34	2.32	2.29 2.27
14.75 CFS	2.25	2.23	2.20	2.18	2.16	2.14	2.11 2.09
15.15 CFS	2.07	2.04	2.02	2.00	1.98	1.95	1.93 1.91
15.55 CFS	1.88	1.86	1.84	1.82	1.79	1.77	1.75 1.72
15.95 CFS	1.70	1.68	1.65	1.63	1.61	1.59	1.58 1.56
16.35 CFS	1.55	1.54	1.53	1.52	1.51	1.50	1.50 1.49
16.75 CFS	1.48	1.47	1.46	1.45	1.45	1.44	1.43 1.42
17.15 CFS	1.41	1.41	1.40	1.39	1.38	1.37	1.36 1.36
17.55 CFS	1.35	1.34	1.33	1.32	1.32	1.31	1.30 1.29

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TR20 -		SCS -		
001	PROJECT: JKC	DATE: 12-3-15	BY: JC	VERSION
12/03/**	FILENAME: BVexwp.DAT			2.04TEST
11:34:42	PASS 1	JOB NO. 1		PAGE 4
17.95 CFS	1.28	1.27	1.26	1.25 1.23 1.22
18.35 CFS	1.22	1.21	1.20	1.19 1.17 1.16
18.75 CFS	1.15	1.14	1.13	1.12 1.11 1.10 1.09
19.15 CFS	1.08	1.07	1.07	1.06 1.05 1.04 1.03 1.02
19.55 CFS	1.01	1.01	1.00	.99 .98 .97 .96 .96
19.95 CFS	.95	.94	.93	.92 .92 .91 .90 .90
20.35 CFS	.90	.89	.89	.89 .89 .88 .88 .88
20.75 CFS	.88	.88	.88	.87 .87 .87 .87 .87
21.15 CFS	.87	.87	.86	.86 .86 .86 .86 .86
21.55 CFS	.85	.85	.85	.85 .85 .84 .84 .84
21.95 CFS	.84	.84	.84	.84 .83 .83 .83 .83
22.35 CFS	.83	.83	.82	.82 .82 .82 .82 .82
22.75 CFS	.81	.81	.81	.81 .81 .80 .80 .80
23.15 CFS	.80	.80	.80	.80 .79 .79 .79 .79
23.55 CFS	.79	.79	.78	.78 .78 .78 .78 .78
23.95 CFS	.78	.77	.75	.69 .59 .46

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
3.16 WATERSHED INCHES; 48 CFS-HRS; 3.9 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	4	2	1	1	1	1	1	0

## BVEWP2.OUT

--- XSECTION 2, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.11	69.9	(NULL)

HRS	MAIN	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	DRAINAGE AREA =	STORM =10	.04 SQ.MI.		
		TIME	INCREMENT = .050 hr,						
9.10	CFS	.50	.52	.55	.57	.59	.61	.63	.65
9.50	CFS	.67	.69	.71	.74	.76	.79	.82	.86
9.90	CFS	.89	.93	.97	1.02	1.06	1.11	1.16	1.21
10.30	CFS	1.27	1.33	1.39	1.46	1.53	1.60	1.68	1.76
10.70	CFS	1.84	1.94	2.04	2.14	2.26	2.38	2.50	2.63
11.10	CFS	2.77	2.93	3.11	3.31	3.54	3.79	4.05	4.34
11.50	CFS	4.65	5.10	5.84	7.15	9.25	12.49	17.10	23.62
11.90	CFS	32.42	43.04	54.57	65.03	69.74	68.16	62.22	54.57
12.30	CFS	46.89	40.46	35.20	30.73	26.93	23.70	20.93	18.59
12.70	CFS	16.63	14.98	13.76	13.02	12.37	11.79	11.26	10.78
13.10	CFS	10.34	9.92	9.53	9.18	8.85	8.54	8.25	7.98
13.50	CFS	7.72	7.47	7.24	7.01	6.80	6.60	6.41	6.23
13.90	CFS	6.05	5.89	5.73	5.57	5.43	5.29	5.16	5.04
14.30	CFS	4.94	4.84	4.75	4.67	4.59	4.51	4.45	4.38
14.70	CFS	4.32	4.26	4.20	4.14	4.09	4.03	3.98	3.93
15.10	CFS	3.88	3.83	3.78	3.74	3.69	3.65	3.60	3.56
15.50	CFS	3.51	3.47	3.43	3.38	3.34	3.30	3.26	3.22
15.90	CFS	3.17	3.13	3.09	3.05	3.01	2.97	2.94	2.90

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TR20	PROJECT:	JKC	DATE:12-3-15	BY:JC	SCS -
001	FILENAME:	BVexwp.DAT			VERSION
12/03/**	PASS	1	JOB NO.	1	2.04TEST
11:34:42					PAGE 5

16.30 CFS	2.87	2.85	2.82	2.80	2.77	2.75	2.73	2.71
16.70 CFS	2.69	2.67	2.66	2.64	2.62	2.60	2.59	2.57
17.10 CFS	2.55	2.54	2.52	2.51	2.49	2.48	2.46	2.45
17.50 CFS	2.43	2.42	2.40	2.39	2.37	2.36	2.34	2.33
17.90 CFS	2.31	2.30	2.28	2.27	2.25	2.24	2.22	2.21
18.30 CFS	2.20	2.18	2.17	2.15	2.14	2.12	2.11	2.09
18.70 CFS	2.08	2.06	2.05	2.04	2.02	2.01	1.99	1.98
19.10 CFS	1.96	1.95	1.93	1.92	1.90	1.89	1.88	1.86
19.50 CFS	1.85	1.83	1.82	1.80	1.79	1.77	1.76	1.74
19.90 CFS	1.73	1.71	1.70	1.68	1.67	1.66	1.65	1.63
20.30 CFS	1.62	1.62	1.61	1.60	1.59	1.59	1.58	1.58
20.70 CFS	1.57	1.57	1.56	1.56	1.55	1.55	1.55	1.54
21.10 CFS	1.54	1.53	1.53	1.53	1.52	1.52	1.52	1.51
21.50 CFS	1.51	1.51	1.50	1.50	1.50	1.50	1.49	1.49
21.90 CFS	1.49	1.48	1.48	1.48	1.47	1.47	1.47	1.47
22.30 CFS	1.46	1.46	1.46	1.45	1.45	1.45	1.45	1.44
22.70 CFS	1.44	1.44	1.43	1.43	1.43	1.43	1.42	1.42
23.10 CFS	1.42	1.41	1.41	1.41	1.41	1.40	1.40	1.40
23.50 CFS	1.39	1.39	1.39	1.39	1.38	1.38	1.38	1.37
23.90 CFS	1.37	1.37	1.36	1.34	1.28	1.16	1.02	.86
24.30 CFS	.72	.61	.53	.46				

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 2.91 WATERSHED INCHES; 80 CFS-HRS; 6.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	7	4	3	2	2	1	1	0

## BVEXWP2.OUT

--- XSECTION 3, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.58	22.3	44.29

HRS	HYDROGRAPH POINTS FOR			ALTERNATE = 1,	DRAINAGE AREA =	STORM =10		
	MAIN TIME	INCREMENT =	.050 hr,			.04	SQ.MI.	
7.35 CFS	.00	.01	.01	.01	.01	.01	.01	.01
7.75 CFS	.02	.02	.02	.02	.03	.03	.03	.03
8.15 CFS	.04	.04	.04	.04	.05	.05	.05	.06
8.55 CFS	.06	.07	.07	.07	.08	.08	.09	.09
8.95 CFS	.10	.11	.11	.12	.13	.13	.14	.15
9.35 CFS	.15	.16	.16	.16	.16	.16	.16	.16
9.75 CFS	.17	.17	.17	.17	.17	.18	.18	.18
10.15 CFS	.18	.19	.19	.19	.20	.20	.20	.21
10.55 CFS	.21	.21	.22	.22	.23	.23	.24	.24
10.95 CFS	.25	.26	.26	.27	.28	.29	.29	.30
11.35 CFS	.31	.32	.33	.34	.35	.36	.37	.38
11.75 CFS	.39	.42	.45	.48	.52	1.03	2.73	6.57
12.15 CFS	11.64	15.38	18.13	20.20	21.57	21.88	22.09	22.21

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TR20 ----- SCS -  
 001 PROJECT: JK C DATE: 12-3-15 BY: JC VERSION  
 12/03/\*\* FILENAME: BVExwp.DAT 2.04TEST  
 11:34:42 PASS 1 JOB NO. 1 PAGE 6

12.55 CFS	22.27	22.27	22.22	22.14	22.02	21.88	21.72	21.55
12.95 CFS	21.01	20.41	19.81	19.22	18.64	18.07	17.51	16.97
13.35 CFS	16.45	15.93	15.43	14.95	14.48	14.03	13.59	13.16
13.75 CFS	12.63	12.13	11.66	11.21	10.79	10.38	10.00	9.63
14.15 CFS	9.28	8.95	8.64	8.34	8.06	7.80	7.55	7.31
14.55 CFS	7.08	6.87	6.67	6.48	6.30	6.14	5.98	5.82
14.95 CFS	5.68	5.54	5.41	5.29	5.18	5.06	4.96	4.86
15.35 CFS	4.76	4.67	4.58	4.49	4.41	4.33	4.26	4.19
15.75 CFS	4.12	4.05	3.98	3.92	3.86	3.80	3.74	3.68
16.15 CFS	3.62	3.57	3.52	3.49	3.47	3.46	3.44	3.42
16.55 CFS	3.40	3.38	3.36	3.34	3.32	3.30	3.29	3.27
16.95 CFS	3.25	3.23	3.21	3.19	3.17	3.15	3.14	3.12
17.35 CFS	3.10	3.08	3.06	3.05	3.03	3.01	2.99	2.97
17.75 CFS	2.96	2.94	2.92	2.90	2.89	2.87	2.85	2.84
18.15 CFS	2.82	2.80	2.78	2.77	2.75	2.73	2.72	2.70
18.55 CFS	2.68	2.67	2.65	2.64	2.62	2.60	2.59	2.57
18.95 CFS	2.55	2.54	2.52	2.51	2.49	2.48	2.46	2.44
19.35 CFS	2.43	2.41	2.40	2.38	2.36	2.35	2.33	2.32
19.75 CFS	2.30	2.29	2.27	2.26	2.24	2.23	2.21	2.19
20.15 CFS	2.18	2.16	2.15	2.13	2.12	2.10	2.09	2.08
20.55 CFS	2.06	2.05	2.03	2.02	2.01	2.00	1.98	1.97
20.95 CFS	1.96	1.95	1.94	1.92	1.91	1.90	1.89	1.88
21.35 CFS	1.87	1.86	1.85	1.84	1.83	1.82	1.81	1.80
21.75 CFS	1.79	1.79	1.78	1.77	1.76	1.75	1.74	1.74
22.15 CFS	1.73	1.72	1.71	1.71	1.70	1.69	1.69	1.68
22.55 CFS	1.67	1.67	1.66	1.65	1.65	1.64	1.64	1.63
22.95 CFS	1.62	1.62	1.61	1.61	1.60	1.60	1.59	1.59
23.35 CFS	1.58	1.57	1.57	1.56	1.56	1.56	1.55	1.55
23.75 CFS	1.54	1.54	1.53	1.53	1.52	1.52	1.51	1.51
24.15 CFS	1.50	1.49	1.47	1.45	1.43	1.40	1.38	1.35
24.55 CFS	1.32	1.29	1.27	1.24	1.21	1.18	1.15	1.12
24.95 CFS	1.09	1.07	1.04	1.01	.99	.96	.93	.91
25.35 CFS	.89	.86	.84	.82	.79	.77	.75	.73

					BVEXWP2.OUT				
25.75 CFS	.71	.69	.67	.65	.63	.62	.60	.58	
26.15 CFS	.56	.55							

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 2.47 WATERSHED INCHES; 68 CFS-HRS; 5.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	14	
FLOW(CFS)	9	4	3	2	2	2	1	1	TRUNCATED

--- STRUCTURE 2, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 4

PEAK TIME(HRS)		PEAK DISCHARGE(CFS)		PEAK ELEVATION(FEET)	
12.07		14.5		(RUNOFF)	

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 PASS 1 JOB NO. 1 PAGE 7

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10							
HRS	MAIN TIME INCREMENT = .050 hr,	DRAINAGE AREA = .01 SQ.MI.					
10.95 CFS	.49 .51 .54 .57 .60 .64 .68 .73						
11.35 CFS	.78 .84 .90 .96 1.06 1.23 1.57 2.12						
11.75 CFS	2.96 4.10 5.72 7.91 10.52 12.91 14.36 14.24						
12.15 CFS	12.74 10.57 8.40 6.61 5.36 4.47 3.78 3.26						
12.55 CFS	2.84 2.51 2.24 2.02 1.85 1.71 1.61 1.52						
12.95 CFS	1.45 1.38 1.33 1.28 1.24 1.19 1.16 1.12						
13.35 CFS	1.09 1.06 1.04 1.01 .98 .96 .93 .91						
13.75 CFS	.89 .87 .85 .83 .81 .79 .77 .75						
14.15 CFS	.74 .72 .71 .70 .69 .68 .68 .67						
14.55 CFS	.66 .66 .65 .64 .64 .63 .62 .62						
14.95 CFS	.61 .60 .60 .59 .58 .58 .57 .57						
15.35 CFS	.56 .55 .55 .54 .53 .53 .52 .51						
15.75 CFS	.51 .50 .49						

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.07 WATERSHED INCHES; 13 CFS-HRS; 1.1 ACRE-FEET.

DURATION(HRS)	2	4	5
FLOW(CFS)	1	1	0

--- XSECTION 4, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 5

PEAK TIME(HRS)		PEAK DISCHARGE(CFS)		PEAK ELEVATION(FEET)	
12.33		27.0		(NULL)	

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10							
HRS	MAIN TIME INCREMENT = .050 hr,	DRAINAGE AREA = .05 SQ.MI.					
10.40 CFS	.49 .51 .52 .54 .56 .58 .60 .63						
10.80 CFS	.65 .68 .71 .74 .77 .80 .84 .88						
11.20 CFS	.92 .97 1.03 1.09 1.16 1.23 1.31 1.41						
11.60 CFS	1.59 1.94 2.50 3.36 4.51 6.17 8.39 11.04						
12.00 CFS	13.95 17.08 20.81 24.38 25.95 26.53 26.82 26.94						
12.40 CFS	26.34 25.87 25.47 25.11 24.78 24.46 24.16 23.87						
12.80 CFS	23.59 23.32 23.07 22.46 21.79 21.14 20.50 19.87						

BVEWP2.OUT								
13.20 CFS	19.26	18.67	18.10	17.54	17.00	16.47	15.96	15.46
13.60 CFS	14.98	14.52	14.07	13.52	13.00	12.51	12.04	11.59
14.00 CFS	11.17	10.77	10.38	10.02	9.68	9.35	9.04	8.75
14.40 CFS	8.48	8.22	7.98	7.75	7.53	7.32	7.13	6.94
14.80 CFS	6.76	6.60	6.44	6.29	6.15	6.01	5.88	5.76
15.20 CFS	5.64	5.53	5.42	5.32	5.22	5.13	5.03	4.95
15.60 CFS	4.86	4.78	4.70	4.62	4.55	4.48	4.41	4.34
16.00 CFS	4.27	4.20	4.14	4.08	4.02	3.96	3.94	3.91
16.40 CFS	3.89	3.87	3.85	3.83	3.81	3.79	3.76	3.74
16.80 CFS	3.72	3.70	3.68	3.66	3.64	3.62	3.59	3.57
17.20 CFS	3.55	3.53	3.51	3.49	3.47	3.45	3.43	3.41
17.60 CFS	3.39	3.37	3.35	3.33	3.31	3.29	3.27	3.25
18.00 CFS	3.23	3.21	3.19	3.17	3.15	3.13	3.11	3.10

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 PASS 1 JOB NO. 1 PAGE 8

18.40 CFS	3.08	3.06	3.04	3.02	3.00	2.98	2.96	2.94
18.80 CFS	2.93	2.91	2.89	2.87	2.85	2.83	2.82	2.80
19.20 CFS	2.78	2.76	2.74	2.72	2.71	2.69	2.67	2.65
19.60 CFS	2.63	2.62	2.60	2.58	2.56	2.55	2.53	2.51
20.00 CFS	2.49	2.47	2.46	2.44	2.42	2.41	2.39	2.37
20.40 CFS	2.36	2.34	2.33	2.31	2.30	2.29	2.27	2.26
20.80 CFS	2.24	2.23	2.22	2.21	2.19	2.18	2.17	2.16
21.20 CFS	2.15	2.14	2.13	2.11	2.10	2.09	2.08	2.07
21.60 CFS	2.06	2.05	2.04	2.03	2.03	2.02	2.01	2.00
22.00 CFS	1.99	1.98	1.97	1.97	1.96	1.95	1.94	1.94
22.40 CFS	1.93	1.92	1.91	1.91	1.90	1.89	1.89	1.88
22.80 CFS	1.87	1.87	1.86	1.85	1.85	1.84	1.83	1.83
23.20 CFS	1.82	1.82	1.81	1.81	1.80	1.79	1.79	1.78
23.60 CFS	1.78	1.77	1.77	1.76	1.76	1.75	1.75	1.74
24.00 CFS	1.74	1.73	1.70	1.66	1.61	1.56	1.51	1.47
24.40 CFS	1.43	1.40	1.36	1.33	1.30	1.27	1.24	1.21
24.80 CFS	1.18	1.15	1.12	1.09	1.07	1.04	1.01	.99
25.20 CFS	.96	.93	.91	.89	.86	.84	.82	.79
25.60 CFS	.77	.75	.73	.71	.69	.67	.65	.63
26.00 CFS	.62	.60	.58	.56	.55			

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 2.55 WATERSHED INCHES; 81 CFS-HRS; 6.7 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	11	5	3	3	2	2	1	1

1 TRUNCATED

--- XSECTION 5, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

EXECUTIVE CONTROL ENDCMP COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL COMPUT FROM XSECTION 1 TO XSECTION 5  
 STARTING TIME = .00 RAIN DEPTH = 7.40 RAIN DURATION = 1.00  
 ANT. RUNOFF COND. = 2 MAIN TIME INCREMENT = .050 HOURS  
 ALTERNATE NO. = 1 STORM NO. = 99 RAIN TABLE NO. = 2

OPERATION RUNOFF XSECTION 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET) (RUNOFF)
12.07	60.0	

Page 8

BVEXWP2.OUT

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =99

HRS	MAIN TIME INCREMENT = .050 hr,	DRAINAGE AREA = .02 SQ.MI.
8.95 CFS	.48 .50 .53 .55 .57 .59 .61 .62	
9.35 CFS	.64 .66 .67 .68 .70 .71 .73 .75	
9.75 CFS	.78 .80 .83 .86 .90 .93 .97 1.01	

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TR20 ----- SCS -  
001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
11:34:42 PASS 2 JOB NO. 1 PAGE 9

10.15	CFS	1.05	1.09	1.14	1.19	1.24	1.29	1.35	1.41
10.55	CFS	1.47	1.53	1.60	1.67	1.76	1.84	1.93	2.03
10.95	CFS	2.13	2.24	2.35	2.47	2.61	2.77	2.95	3.15
11.35	CFS	3.37	3.61	3.86	4.13	4.54	5.31	6.73	9.04
11.75	CFS	12.52	17.44	24.27	33.39	44.15	54.06	59.45	59.01
12.15	CFS	52.80	43.68	34.70	27.39	22.15	18.39	15.55	13.42
12.55	CFS	11.72	10.34	9.21	8.30	7.61	7.05	6.60	6.24
12.95	CFS	5.94	5.69	5.47	5.26	5.07	4.90	4.75	4.61
13.35	CFS	4.49	4.37	4.25	4.14	4.04	3.93	3.83	3.73
13.75	CFS	3.64	3.56	3.48	3.40	3.32	3.24	3.17	3.09
14.15	CFS	3.03	2.97	2.92	2.87	2.84	2.80	2.77	2.74
14.55	CFS	2.71	2.69	2.66	2.63	2.61	2.58	2.55	2.53
14.95	CFS	2.50	2.47	2.45	2.42	2.40	2.37	2.34	2.32
15.35	CFS	2.29	2.26	2.24	2.21	2.18	2.16	2.13	2.10
15.75	CFS	2.08	2.05	2.02	2.00	1.97	1.94	1.92	1.89
16.15	CFS	1.87	1.85	1.83	1.81	1.80	1.79	1.78	1.76
16.55	CFS	1.75	1.74	1.74	1.73	1.72	1.71	1.70	1.69
16.95	CFS	1.68	1.67	1.66	1.65	1.64	1.63	1.62	1.61
17.35	CFS	1.60	1.59	1.58	1.57	1.56	1.55	1.54	1.54
17.75	CFS	1.53	1.52	1.51	1.50	1.49	1.48	1.47	1.46
18.15	CFS	1.45	1.44	1.43	1.42	1.41	1.40	1.39	1.38
18.55	CFS	1.37	1.36	1.35	1.34	1.33	1.32	1.31	1.30
18.95	CFS	1.29	1.28	1.27	1.26	1.25	1.25	1.24	1.23
19.35	CFS	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15
19.75	CFS	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07
20.15	CFS	1.06	1.05	1.05	1.04	1.04	1.04	1.03	1.03
20.55	CFS	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02
20.95	CFS	1.01	1.01	1.01	1.01	1.01	1.00	1.00	1.00
21.35	CFS	1.00	1.00	.99	.99	.99	.99	.99	.99
21.75	CFS	.98	.98	.98	.98	.98	.97	.97	.97
22.15	CFS	.97	.97	.96	.96	.96	.96	.96	.95
22.55	CFS	.95	.95	.95	.95	.95	.94	.94	.94
22.95	CFS	.94	.94	.93	.93	.93	.93	.93	.92
23.35	CFS	.92	.92	.92	.92	.91	.91	.91	.91
23.75	CFS	.91	.91	.90	.90	.90	.89	.87	.80
24.15	CFS	.67	.51	.37					

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
4.50 WATERSHED INCHES; 55 CFS-HRS; 4.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	4	2	2	1	1	1	1	0

--- XSECTION 1, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 1  
♀

TR20 ----- SCS --  
Page 9

001  
12/03/\*\*  
11:34:42

BVEXWP2.OUT  
PROJECT: JKC DATE: 12-3-15 BY: JC  
FILENAME: BVexwp.DAT  
PASS 2 JOB NO. 1  
VERSION 2.04TEST  
PAGE 10

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(FEET)  
12.20 43.9 51.78

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM = 99  
HRS MAIN TIME INCREMENT = .050 hr, DRAINAGE AREA = .02 SQ.MI.  
6.90 CFS .00 .01 .01 .01 .01 .02 .02 .03  
7.30 CFS .03 .04 .04 .05 .05 .06 .07 .07  
7.70 CFS .08 .09 .09 .10 .11 .11 .12 .13  
8.10 CFS .14 .15 .15 .16 .17 .18 .19 .20  
8.50 CFS .21 .22 .24 .25 .26 .27 .29 .30  
8.90 CFS .32 .33 .35 .36 .38 .40 .42 .43  
9.30 CFS .45 .47 .49 .50 .52 .54 .56 .57  
9.70 CFS .59 .61 .62 .64 .66 .68 .71 .73  
10.10 CFS .76 .78 .81 .84 .87 .91 .94 .98  
10.50 CFS 1.02 1.06 1.10 1.15 1.20 1.25 1.30 1.36  
10.90 CFS 1.42 1.49 1.56 1.63 1.71 1.79 1.88 1.97  
11.30 CFS 2.08 2.20 2.32 2.46 2.61 2.78 2.99 3.29  
11.70 CFS 3.75 4.44 5.48 6.99 11.13 17.54 24.85 32.25  
12.10 CFS 38.50 42.53 43.85 42.77 40.06 36.51 32.75 29.09  
12.50 CFS 25.70 22.66 19.97 17.60 15.55 13.79 12.29 11.03  
12.90 CFS 9.96 9.06 8.31 7.68 7.45 7.22 7.00 6.79  
13.30 CFS 6.58 6.38 6.19 6.00 5.83 5.65 5.49 5.33  
13.70 CFS 5.18 5.03 4.89 4.76 4.63 4.50 4.38 4.26  
14.10 CFS 4.15 4.04 3.94 3.84 3.75 3.66 3.58 3.50  
14.50 CFS 3.43 3.36 3.29 3.23 3.17 3.12 3.07 3.02  
14.90 CFS 2.97 2.93 2.88 2.84 2.80 2.76 2.73 2.69  
15.30 CFS 2.65 2.62 2.59 2.55 2.52 2.49 2.46 2.43  
15.70 CFS 2.40 2.37 2.34 2.31 2.28 2.25 2.22 2.19  
16.10 CFS 2.16 2.13 2.11 2.08 2.05 2.03 2.01 1.98  
16.50 CFS 1.96 1.94 1.92 1.91 1.89 1.87 1.86 1.84  
16.90 CFS 1.83 1.81 1.80 1.79 1.77 1.76 1.75 1.74  
17.30 CFS 1.72 1.71 1.70 1.69 1.68 1.67 1.66 1.65  
17.70 CFS 1.64 1.63 1.62 1.61 1.59 1.58 1.57 1.56  
18.10 CFS 1.55 1.54 1.53 1.52 1.51 1.51 1.50 1.49  
18.50 CFS 1.48 1.47 1.46 1.45 1.44 1.43 1.42 1.41  
18.90 CFS 1.40 1.39 1.38 1.37 1.36 1.35 1.34 1.33  
19.30 CFS 1.32 1.31 1.30 1.29 1.28 1.27 1.26 1.25  
19.70 CFS 1.24 1.23 1.22 1.21 1.20 1.19 1.18 1.17  
20.10 CFS 1.16 1.15 1.14 1.13 1.13 1.12 1.11 1.10  
20.50 CFS 1.10 1.09 1.08 1.08 1.07 1.07 1.06 1.06  
20.90 CFS 1.05 1.05 1.05 1.04 1.04 1.04 1.03 1.03  
21.30 CFS 1.03 1.02 1.02 1.02 1.02 1.01 1.01 1.01  
21.70 CFS 1.01 1.01 1.00 1.00 1.00 1.00 0.99 0.99  
22.10 CFS .99 .99 .99 .98 .98 .98 .98 .98  
22.50 CFS .97 .97 .97 .97 .97 .96 .96 .96  
22.90 CFS .96 .96 .95 .95 .95 .95 .95 .94  
23.30 CFS .94 .94 .94 .94 .94 .93 .93 .93  
23.70 CFS .93 .93 .92 .92 .92 .92 .92 .91  
24.10 CFS .90 .89 .86 .82 .77 .71 .66 .60  
24.50 CFS .55 .50 .45 .41 .37 .33 .30 .27

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TR20 ----- SCS -  
001 PROJECT: JKC DATE: 12-3-15 BY: JC  
12/03/\*\* FILENAME: BVexwp.DAT VERSION  
11:34:42 PASS 2 JOB NO. 1 2.04TEST  
PAGE 11

24.90 CFS .24 .22 .20 .18 .16 .15 .13 .12  
Page 10

	BVEXWP2.OUT							
25.30 CFS	.11	.10	.09	.08	.07	.06	.06	.05
25.70 CFS	.05	.04	.04	.03	.03	.03	.02	.02
26.10 CFS	.02	.02	.02	.01	.01	.01	.01	

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.50 WATERSHED INCHES; 55 CFS-HRS; 4.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	5	3	2	1	1	1	1	0

--- STRUCTURE 1, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)			PEAK ELEVATION(FEET)
12.07	82.4			(RUNOFF)

HRS	MAIN	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	STORM = 99	DRAINAGE AREA = .02	SQ.MI.		
		TIME	INCREMENT = .050 hr,						
7.50 CFS		.49	.50	.51	.53	.54	.55	.56	.58
7.90 CFS		.59	.60	.62	.63	.65	.66	.68	.70
8.30 CFS		.72	.74	.77	.80	.82	.85	.88	.91
8.70 CFS		.94	.98	1.01	1.04	1.08	1.11	1.14	1.18
9.10 CFS	1.21	1.25	1.28	1.31	1.33	1.35	1.37	1.39	
9.50 CFS	1.41	1.43	1.45	1.47	1.50	1.54	1.58	1.62	
9.90 CFS	1.67	1.73	1.78	1.84	1.90	1.96	2.03	2.10	
10.30 CFS	2.18	2.26	2.35	2.44	2.53	2.62	2.72	2.82	
10.70 CFS	2.94	3.06	3.19	3.33	3.48	3.63	3.79	3.96	
11.10 CFS	4.14	4.34	4.57	4.84	5.14	5.47	5.82	6.19	
11.50 CFS	6.60	7.22	8.31	10.30	13.48	18.48	25.35	34.76	
11.90 CFS	47.03	61.24	74.36	81.58	81.23	73.28	61.23	48.95	
12.30 CFS	38.61	31.18	25.84	21.79	18.66	16.18	14.22	12.64	
12.70 CFS	11.36	10.35	9.54	8.90	8.38	7.95	7.59	7.27	
13.10 CFS	6.99	6.74	6.51	6.30	6.11	5.94	5.78	5.62	
13.50 CFS	5.48	5.33	5.19	5.06	4.93	4.81	4.69	4.58	
13.90 CFS	4.48	4.37	4.27	4.17	4.07	3.98	3.91	3.84	
14.30 CFS	3.78	3.72	3.68	3.64	3.60	3.56	3.52	3.48	
14.70 CFS	3.45	3.41	3.38	3.34	3.31	3.27	3.24	3.20	
15.10 CFS	3.17	3.13	3.10	3.06	3.03	2.99	2.96	2.92	
15.50 CFS	2.89	2.85	2.82	2.78	2.75	2.71	2.68	2.64	
15.90 CFS	2.61	2.57	2.54	2.50	2.47	2.44	2.41	2.38	
16.30 CFS	2.36	2.35	2.33	2.31	2.30	2.29	2.27	2.26	
16.70 CFS	2.25	2.23	2.22	2.21	2.20	2.18	2.17	2.16	
17.10 CFS	2.15	2.13	2.12	2.11	2.10	2.08	2.07	2.06	
17.50 CFS	2.05	2.03	2.02	2.01	2.00	1.98	1.97	1.96	
17.90 CFS	1.95	1.93	1.92	1.91	1.89	1.88	1.87	1.86	
18.30 CFS	1.84	1.83	1.82	1.81	1.79	1.78	1.77	1.75	
18.70 CFS	1.74	1.73	1.72	1.70	1.69	1.68	1.67	1.65	
19.10 CFS	1.64	1.63	1.62	1.60	1.59	1.58	1.56	1.55	

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TR20	PROJECT:	JKC	DATE: 12-3-15	BY: JC	SCS -			
001	FILENAME:	BVexwp.DAT			VERSION			
12/03/**	PASS	2	JOB NO.	1	2.04TEST			
11:34:42					PAGE 12			
19.50 CFS	1.54	1.53	1.51	1.50	1.49	1.47	1.46	1.45
19.90 CFS	1.44	1.42	1.41	1.40	1.39	1.37	1.37	1.36
20.30 CFS	1.35	1.35	1.34	1.34	1.33	1.33	1.33	1.33
20.70 CFS	1.32	1.32	1.32	1.32	1.31	1.31	1.31	1.31
21.10 CFS	1.30	1.30	1.30	1.30	1.29	1.29	1.29	1.29
21.50 CFS	1.28	1.28	1.28	1.28	1.27	1.27	1.27	1.27

	BVEWP2.OUT							
21.90 CFS	1.26	1.26	1.26	1.26	1.25	1.25	1.25	1.25
22.30 CFS	1.24	1.24	1.24	1.24	1.23	1.23	1.23	1.23
22.70 CFS	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21
23.10 CFS	1.20	1.20	1.20	1.20	1.19	1.19	1.19	1.19
23.50 CFS	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.17
23.90 CFS	1.16	1.16	1.15	1.12	1.04	.88	.69	.50

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.17 WATERSHED INCHES; 78 CFS-HRS; 6.4 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	6	3	2	2	1	1	1	1

DURATION(HRS)	17
FLOW(CFS)	0

--- XSECTION 2, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.11	119.8	(NULL)

HRS	MAIN	HYDROGRAPH POINTS FOR			ALTERNATE = 1,	DRAINAGE AREA =	STORM =99	
		TIME	INCREMENT =	.050 hr,				.04 SQ.MI.
7.35 CFS	.49	.50	.52	.54	.56	.58	.60	.62
7.75 CFS	.64	.66	.68	.70	.72	.74	.76	.78
8.15 CFS	.81	.83	.86	.89	.93	.96	1.00	1.04
8.55 CFS	1.08	1.12	1.16	1.20	1.25	1.30	1.34	1.39
8.95 CFS	1.44	1.49	1.54	1.60	1.65	1.69	1.74	1.78
9.35 CFS	1.82	1.86	1.90	1.93	1.97	2.01	2.05	2.09
9.75 CFS	2.14	2.20	2.27	2.34	2.41	2.49	2.57	2.66
10.15 CFS	2.75	2.84	2.95	3.05	3.17	3.29	3.42	3.54
10.55 CFS	3.68	3.82	3.97	4.13	4.31	4.49	4.69	4.90
10.95 CFS	5.12	5.35	5.59	5.84	6.13	6.45	6.81	7.22
11.35 CFS	7.67	8.14	8.65	9.22	10.00	11.31	13.59	17.22
11.75 CFS	23	31	42	58	79	99	114	120
12.15 CFS	116	105	92	79	68	59	51	44
12.55 CFS	38.84	34.18	30.24	26.92	24.14	21.84	19.92	18.34
12.95 CFS	17.01	15.89	14.95	14.44	13.96	13.51	13.09	12.69
13.35 CFS	12.32	11.96	11.63	11.30	10.99	10.68	10.39	10.11
13.75 CFS	9.84	9.58	9.34	9.10	8.87	8.65	8.43	8.23
14.15 CFS	8.03	7.85	7.68	7.53	7.39	7.26	7.14	7.02
14.55 CFS	6.92	6.81	6.72	6.62	6.53	6.45	6.36	6.28

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TR20	----- SCS -			
001	PROJECT: JKC	DATE: 12-3-15	BY: JC	VERSION
12/03/**	FILENAME: BVexwp.DAT			2.04TEST
11:34:42	PASS 2	JOB NO. 1		PAGE 13

14.95 CFS	6.20	6.12	6.05	5.97	5.90	5.82	5.75	5.68
15.35 CFS	5.61	5.54	5.48	5.41	5.34	5.28	5.21	5.14
15.75 CFS	5.08	5.01	4.95	4.88	4.82	4.76	4.69	4.63
16.15 CFS	4.57	4.52	4.46	4.42	4.38	4.34	4.30	4.26
16.55 CFS	4.23	4.20	4.17	4.14	4.11	4.08	4.05	4.02
16.95 CFS	4.00	3.97	3.94	3.92	3.89	3.87	3.84	3.82
17.35 CFS	3.80	3.77	3.75	3.72	3.70	3.68	3.65	3.63
17.75 CFS	3.61	3.59	3.56	3.54	3.52	3.49	3.47	3.45
18.15 CFS	3.43	3.40	3.38	3.36	3.34	3.31	3.29	3.27
18.55 CFS	3.25	3.22	3.20	3.18	3.16	3.13	3.11	3.09
18.95 CFS	3.07	3.04	3.02	3.00	2.98	2.95	2.93	2.91

		BVEWP2.OUT						
19.35 CFS	2.89	2.86	2.84	2.82	2.80	2.77	2.75	2.73
19.75 CFS	2.71	2.68	2.66	2.64	2.62	2.59	2.57	2.55
20.15 CFS	2.53	2.51	2.49	2.48	2.46	2.45	2.44	2.43
20.55 CFS	2.42	2.41	2.40	2.40	2.39	2.38	2.37	2.37
20.95 CFS	2.36	2.35	2.35	2.34	2.34	2.33	2.33	2.32
21.35 CFS	2.32	2.31	2.31	2.30	2.30	2.29	2.29	2.28
21.75 CFS	2.28	2.27	2.27	2.26	2.26	2.25	2.25	2.24
22.15 CFS	2.24	2.23	2.23	2.23	2.22	2.22	2.21	2.21
22.55 CFS	2.20	2.20	2.19	2.19	2.18	2.18	2.18	2.17
22.95 CFS	2.17	2.16	2.16	2.15	2.15	2.14	2.14	2.14
23.35 CFS	2.13	2.13	2.12	2.12	2.11	2.11	2.10	2.10
23.75 CFS	2.10	2.09	2.09	2.08	2.08	2.07	2.04	1.94
24.15 CFS	1.77	1.55	1.32	1.11	.94	.81	.71	.62
24.55 CFS	.55	.48						

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.87 WATERSHED INCHES; 133 CFS-HRS; 11.0 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	11	6	4	3	3	2	2	1

DURATION(HRS)	17
FLOW(CFS)	0

--- XSECTION 3, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 2

PEAK TIME(HRS)	12.71	PEAK DISCHARGE(CFS)	26.4	PEAK ELEVATION(FEET)	47.51
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HRS	MAIN	HYDROGRAPH POINTS FOR	ALTERNATE = 1,	STORM =99
	TIME INCREMENT =	.050 hr,	DRAINAGE AREA =	.04 SQ.MI.
5.75 CFS	.00	.01	.01	.01 .02 .02
6.15 CFS	.02	.02	.03	.03 .04 .04
6.55 CFS	.05	.05	.06	.06 .07 .07
6.95 CFS	.08	.09	.10	.10 .11 .11
7.35 CFS	.13	.13	.14	.14 .15 .15
7.75 CFS	.16	.16	.16	.16 .17 .17

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TR20 ----- SCS -  
 001 PROJECT: JK C DATE: 12-3-15 BY: JC VERSION  
 12/03/\*\* FILENAME: Bvewp.DAT 2.04TEST  
 11:34:42 PASS 2 JOB NO. 1 PAGE 14

8.15 CFS	.17	.17	.18	.18	.18	.18	.19
8.55 CFS	.19	.19	.19	.20	.20	.20	.21
8.95 CFS	.21	.22	.22	.22	.23	.23	.24
9.35 CFS	.25	.25	.25	.26	.26	.27	.28
9.75 CFS	.28	.29	.30	.30	.31	.31	.33
10.15 CFS	.33	.34	.34	.35	.35	.36	.37
10.55 CFS	.37	.38	.38	.39	.39	.40	.41
10.95 CFS	.42	.43	.43	.44	.45	.46	.47
11.35 CFS	.48	.49	.50	.50	.51	.52	.54
11.75 CFS	1.15	1.89	2.88	5.57	10.68	16.21	21.65
12.15 CFS	24.43	24.84	25.21	25.53	25.78	25.98	26.13
12.55 CFS	26.31	26.37	26.40	26.41	26.40	26.38	26.36
12.95 CFS	26.28	26.23	26.17	26.11	26.05	25.99	25.93
13.35 CFS	25.78	25.71	25.64	25.56	25.48	25.40	25.32
13.75 CFS	25.16	25.08	25.00	24.92	24.85	24.77	24.69
14.15 CFS	24.54	24.46	24.38	24.30	24.22	24.07	23.75

BVEWPZ.OUT								
14.55 CFS	23.13	22.83	22.53	22.23	21.94	21.65	20.98	20.05
14.95 CFS	19.17	18.34	17.56	16.82	16.13	15.47	14.85	14.27
15.35 CFS	13.72	13.20	12.59	12.01	11.47	10.97	10.50	10.07
15.75 CFS	9.66	9.29	8.94	8.61	8.31	8.02	7.75	7.50
16.15 CFS	7.26	7.04	6.84	6.64	6.46	6.29	6.13	5.98
16.55 CFS	5.84	5.70	5.58	5.46	5.36	5.25	5.16	5.06
16.95 CFS	4.98	4.90	4.82	4.75	4.68	4.62	4.55	4.49
17.35 CFS	4.44	4.39	4.33	4.29	4.24	4.19	4.15	4.11
17.75 CFS	4.07	4.03	3.99	3.96	3.92	3.89	3.86	3.82
18.15 CFS	3.79	3.76	3.73	3.70	3.67	3.65	3.62	3.59
18.55 CFS	3.56	3.54	3.51	3.50	3.49	3.48	3.47	3.46
18.95 CFS	3.45	3.44	3.43	3.41	3.40	3.39	3.38	3.36
19.35 CFS	3.35	3.34	3.32	3.31	3.29	3.28	3.26	3.25
19.75 CFS	3.23	3.22	3.20	3.19	3.17	3.15	3.14	3.12
20.15 CFS	3.10	3.09	3.07	3.05	3.04	3.02	3.00	2.99
20.55 CFS	2.97	2.95	2.94	2.92	2.91	2.89	2.88	2.86
20.95 CFS	2.85	2.83	2.82	2.81	2.79	2.78	2.77	2.75
21.35 CFS	2.74	2.73	2.72	2.71	2.69	2.68	2.67	2.66
21.75 CFS	2.65	2.64	2.63	2.62	2.61	2.60	2.59	2.58
22.15 CFS	2.57	2.56	2.55	2.54	2.53	2.52	2.51	2.50
22.55 CFS	2.49	2.49	2.48	2.47	2.46	2.45	2.45	2.44
22.95 CFS	2.43	2.42	2.41	2.41	2.40	2.39	2.39	2.38
23.35 CFS	2.37	2.36	2.36	2.35	2.34	2.34	2.33	2.32
23.75 CFS	2.32	2.31	2.30	2.30	2.29	2.29	2.28	2.27
24.15 CFS	2.26	2.24	2.22	2.19	2.16	2.12	2.08	2.04
24.55 CFS	2.00	1.95	1.91	1.87	1.82	1.78	1.74	1.69

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
4.35 WATERSHED INCHES; 119 CFS-HRS; 9.8 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	13
FLOW(CFS)	24	8	4	3	3	2	2

TRUNCATED

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TR20 ----- SCS -  
001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
11:34:42 PASS 2 JOB NO. 1 PAGE 15

--- STRUCTURE 2, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 4

PEAK TIME(HRS)	12.07	PEAK DISCHARGE(CFS)	23.5	PEAK ELEVATION(FEET)	(RUNOFF)
HRS	MAIN TIME INCREMENT = .050	HYDROGRAPH POINTS FOR hr,	ALTERNATE = 1,	STORM = 99	
10.05 CFS	.50 .51	.53 .55	.57 .59	.62 .64	
10.45 CFS	.66 .69	.72 .74	.77 .80	.84 .88	
10.85 CFS	.91 .96	1.00 1.04	1.09 1.14	1.20 1.26	
11.25 CFS	1.34 1.43	1.52 1.62	1.72 1.84	2.01 2.32	
11.65 CFS	2.90 3.87	5.34 7.33	10.02 13.59	17.73 21.36	
12.05 CFS	23.35 23.14	20.57 16.97	13.48 10.60	8.49 7.06	
12.45 CFS	5.97 5.13	4.46 3.92	3.49 3.15	2.87 2.66	
12.85 CFS	2.48 2.35	2.23 2.14	2.05 1.97	1.90 1.84	
13.25 CFS	1.78 1.73	1.68 1.64	1.59 1.55	1.51 1.47	
13.65 CFS	1.43 1.40	1.36 1.33	1.30 1.27	1.24 1.21	
14.05 CFS	1.18 1.16	1.13 1.11	1.09 1.07	1.06 1.05	
14.45 CFS	1.03 1.02	1.01 1.00	.99 .98	.97 .96	
14.85 CFS	.95 .94	.93 .92	.91 .90	.89 .88	

	BVEWP2.OUT							
15.25 CFS	.87	.86	.85	.84	.83	.82	.81	.80
15.65 CFS	.79	.78	.77	.76	.75	.74	.73	.72
16.05 CFS	.71	.70	.69	.69	.68	.67	.67	.66
16.45 CFS	.66	.65	.65	.65	.64	.64	.64	.63
16.85 CFS	.63	.63	.62	.62	.61	.61	.61	.60
17.25 CFS	.60	.60	.59	.59	.59	.58	.58	.58
17.65 CFS	.57	.57	.56	.56	.56	.55	.55	.55
18.05 CFS	.54	.54	.54	.53	.53	.53	.52	.52
18.45 CFS	.51	.51	.51	.50	.50			

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.06 WATERSHED INCHES; 22 CFS-HRS; 1.8 ACRE-FEET.

DURATION(HRS)	2	4	6	8	9
FLOW(CFS)	2	1	1	1	0

--- XSECTION 4, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)			PEAK ELEVATION(FEET)		
12.10	46.6			(NULL)		

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =99						
HRS	MAIN TIME	INCREMENT	= .050 hr,	DRAINAGE AREA	= .05 SQ.MI.	
8.90 CFS	.49	.51	.52	.53	.55	.56 .57 .58
9.30 CFS	.60	.61	.62	.63	.64	.65 .66 .67
9.70 CFS	.68	.70	.71	.73	.75	.77 .80 .82

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 PASS 2 JOB NO. 1 PAGE 16

10.10 CFS	.84	.87	.89	.92	.94	.97	1.00	1.03
10.50 CFS	1.06	1.09	1.12	1.15	1.19	1.23	1.27	1.32
10.90 CFS	1.37	1.42	1.47	1.52	1.58	1.65	1.72	1.80
11.30 CFS	1.90	2.00	2.10	2.22	2.34	2.53	2.85	3.43
11.70 CFS	4.46	6.48	9.22	12.90	19.16	28.41	37.57	45.00
12.10 CFS	46.57	44.99	41.80	38.69	36.13	34.28	33.04	32.10
12.50 CFS	31.36	30.77	30.28	29.88	29.55	29.27	29.04	28.84
12.90 CFS	28.67	28.51	28.36	28.22	28.09	27.96	27.83	27.71
13.30 CFS	27.58	27.46	27.35	27.23	27.11	26.99	26.87	26.76
13.70 CFS	26.64	26.52	26.41	26.30	26.19	26.09	25.98	25.88
14.10 CFS	25.77	25.67	25.57	25.47	25.37	25.28	25.11	24.79
14.50 CFS	24.46	24.14	23.83	23.52	23.21	22.91	22.61	21.93
14.90 CFS	20.99	20.10	19.26	18.47	17.72	17.02	16.35	15.73
15.30 CFS	15.13	14.57	14.05	13.42	12.83	12.28	11.77	11.29
15.70 CFS	10.85	10.44	10.05	9.69	9.35	9.04	8.74	8.46
16.10 CFS	8.20	7.96	7.73	7.51	7.31	7.13	6.95	6.79
16.50 CFS	6.63	6.49	6.35	6.22	6.10	5.99	5.89	5.78
16.90 CFS	5.69	5.60	5.52	5.44	5.36	5.29	5.22	5.15
17.30 CFS	5.09	5.03	4.98	4.92	4.87	4.82	4.77	4.72
17.70 CFS	4.68	4.64	4.59	4.55	4.51	4.47	4.44	4.40
18.10 CFS	4.36	4.33	4.29	4.26	4.23	4.20	4.16	4.13
18.50 CFS	4.10	4.07	4.04	4.01	4.00	3.98	3.97	3.96
18.90 CFS	3.94	3.93	3.91	3.90	3.88	3.86	3.85	3.83
19.30 CFS	3.82	3.80	3.78	3.76	3.75	3.73	3.71	3.69
19.70 CFS	3.67	3.65	3.63	3.61	3.59	3.58	3.56	3.54
20.10 CFS	3.52	3.50	3.48	3.46	3.44	3.42	3.40	3.38
20.50 CFS	3.37	3.35	3.33	3.32	3.30	3.28	3.27	3.25

BVEXWP2.OUT								
20.90 CFS	3.24	3.22	3.21	3.19	3.18	3.16	3.15	3.14
21.30 CFS	3.12	3.11	3.10	3.08	3.07	3.06	3.05	3.03
21.70 CFS	3.02	3.01	3.00	2.99	2.98	2.97	2.96	2.94
22.10 CFS	2.93	2.92	2.91	2.90	2.89	2.88	2.87	2.86
22.50 CFS	2.85	2.84	2.83	2.82	2.81	2.80	2.79	
22.90 CFS	2.78	2.77	2.77	2.76	2.75	2.74	2.73	2.73
23.30 CFS	2.72	2.71	2.70	2.70	2.69	2.68	2.67	2.67
23.70 CFS	2.66	2.65	2.64	2.64	2.63	2.62	2.62	2.60
24.10 CFS	2.56	2.51	2.43	2.35	2.28	2.22	2.16	2.11
24.50 CFS	2.06	2.01	1.96	1.92	1.87	1.82	1.78	1.74
24.90 CFS	1.69							

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.45 WATERSHED INCHES; 141 CFS-HRS; 11.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	TRUNCATED
FLOW(CFS)	26	10	5	4	3	3	2	

--- XSECTION 5, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

†

TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 PASS 3 JOB NO. 1 PAGE 17

EXECUTIVE CONTROL ENDCMP COMPUTATIONS COMPLETED FOR PASS 2  
 †

TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 SUMMARY, JOB NO. 1 PAGE 18

#### SUMMARY TABLE 1

SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.  
 A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:  
 F-FLAT TOP HYDROGRAPH T-TRUNCATED HYDROGRAPH R-RISING TRUNCATED HYDROGRAPH

XSECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RUNOFF AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
------------------------------	----------------------------------	-----------------------------	--------------------------	-------------------	--------------	------------------------------------	------------------------------------

RAINFALL OF 5.20 inches AND 24.00 hr DURATION, BEGINS AT .0 hrs.  
 RAINTABLE NUMBER 2, ARC 2  
 MAIN TIME INCREMENT .050 HOURS

ALTERNATE	1	STORM	10			
XSECTION 1	RUNOFF .02	2.61	---	12.08	35	1750.0
STRUCTURE 1	RESVOR .02	2.61	51.68	12.22	24	1200.0
XSECTION 2	RUNOFF .02	3.16	---	12.08	51	2550.0
XSECTION 3	ADDHYD .04	2.91	---	12.11	70	1750.0
STRUCTURE 2	RESVOR .04	2.47	44.29	12.58	22	550.0
XSECTION 4	RUNOFF .01	3.07	---	12.07	14	1400.0
XSECTION 5	ADDHYD .05	2.55	---	12.33	27	540.0

BVEWP2.OUT  
 RAINFALL OF 7.40 inches AND 24.00 hr DURATION, BEGINS AT .0 hrs.

ALTERNATE	1	STORM	99					
XSECTION	1	RUNOFF	.02	4.50	---	12.07	60	3000.0
STRUCTURE	1	RESVOR	.02	4.50	51.78	12.20	44	2200.0
XSECTION	2	RUNOFF	.02	5.17	---	12.07	82	4100.0
XSECTION	3	ADDHYD	.04	4.87	---	12.11	120	3000.0
STRUCTURE	2	RESVOR	.04	4.35	47.51	12.71	26	650.0
XSECTION	4	RUNOFF	.01	5.06	---	12.07	24	2400.0
XSECTION	5	ADDHYD	.05	4.45	---	12.10	47	940.0

♀

TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST  
 11:34:42 SUMMARY, JOB NO. 1 PAGE 19

### SUMMARY TABLE 3

STORM DISCHARGES (CFS) AT XSECTIONS AND STRUCTURES FOR ALL ALTERNATES  
 QUESTION MARK (?) AFTER: OUTFLOW PEAK - RISING TRUNCATED HYDROGRAPH.

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS.....		
		10	99	
STRUCTURE 2	.04			
ALTERNATE 1		22	26	
STRUCTURE 1	.02			
ALTERNATE 1		24	44	
XSECTION 1	.02			
ALTERNATE 1		35	60	
XSECTION 2	.02			
ALTERNATE 1		51	82	
XSECTION 3	.04			
ALTERNATE 1		70	120	
XSECTION 4	.01			
ALTERNATE 1		14	24	
XSECTION 5	.05			
ALTERNATE 1		27	47	

♀  
 TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/03/\*\* FILENAME: BVexwp.DAT 2.04TEST

BVEXWP2.OUT

END OF 1 JOBS IN THIS RUN

\*\*\* WARNING - UNEXPECTED RECORD(S) ENOUNTERED WHEN LOOKING FOR "JOB" RECORD.  
IMAGES OF FIRST 10 RECORDS IGNORED FOLLOW: \*\*\*

SCS TR-20, VERSION 2.04TEST  
001 FILES

INPUT = C:\ENGR\TR20\TR20V204\BVEXWP2.TXT , GIVEN DATA FILE  
OUTPUT = C:\ENGR\TR20\TR20V204\BVEXWP2.OUT , DATED 12/03/\*\*,11:34:42  
FILES GENERATED - DATED 12/03/\*\*,11:34:42

FILE C:\ENGR\TR20\TR20V204\BVEXWP2.TRD CONTAINS READHD INFORMATION

TOTAL NUMBER OF WARNINGS = 1, MESSAGES = 0

JOB ENDED AT 11:34:42  
\*\*\* TR-20 RUN COMPLETED \*\*\*

**Bay Village Summary of Permitted Flows from Pond to I-25**  
4/30/2009 (From original computations)

Preliminary determination of allowable 10-yr discharge from pond to proposed Public Manhole #1:

1 Existing flow to existing inlet # I-25 =	35.33 cfs	Based on original TR-55 computations
2 Existing storm drain downstream of #I-25 designed for	34.8 cfs	Based on existing computations from attached as-built plan
3 Existing flow to existing inlet # I-25 to design to be limited to=	34.8 cfs	Based on more restrictive of items #1 and #2
4 Proposed flow to Bay Village Pond =	88.23 cfs	Based on attached TR-55 computations
5 Proposed flow to Inlet #I-25 =	15.53 cfs	Based on attached TR-55 computations
6 Permitted discharge from Bay Village Pond =	19.27 cfs*	Item #3 - Item #5

Please note that this a preliminary computation based on the assumption that the pond area and bypass area are additive and does not factor in the resulting TR-20 ADDHYD of the bypass area which could allow for a larger flow from the pond. In addition, the capacity of the 27" storm drain at 0.5% must be considered when determining the discharge from the pond.

# **Appendix C**

# **Post-Development Flows**

**RCN VALUE CALCULATIONS  
FOR SWM  
DEVELOPED CONDITIONS**

<b>Development</b>	Bay Village	<b>Date</b>	12/06/15
<b>Location</b>	City of Annapolis	<b>Computed by</b>	JC
<b>Job No.</b>	15-5208		

***Drainage Area 1A (to existing wetland onsite and then to pond)***

***Onsite Lot 4***

pervious area = (modeled as woods - C soils)	1.69 acres	RCN = 70
pervious area = (modeled as lawn - C soils)	0.16 acres	RCN = 74

***Offsite***

impervious area ( C soils) =	0.73 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	2.42 acres	RCN = 74
pervious area = (modeled as woods - C soils)	3.55 acres	RCN = 70
impervious area ( D soils) =	0.35 acres	RCN = 98
pervious area = (modeled as lawn - D soils)	0.73 acres	RCN = 80
pervious area = (modeled as woods - D soils)	2.02 acres	RCN = 77
<b>Total Area =</b>	<b>11.65 acres</b>	
<b>Weighted RCN =</b>	<b>74</b>	

### **Drainage Area 1B (to pond)**

#### **Offsite (from Samaras site west of Bay Village Site)**

impervious area ( C soils) =	0.86 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	1.45 acres	RCN = 74
pervious area = (modeled as woods - C soils)	2.17 acres	RCN = 70
impervious area ( D soils) =	0.87 acres	RCN = 98
pervious area = (modeled as lawn - D soils)	0.44 acres	RCN = 80
pervious area = (modeled as woods - D soils)	0.28 acres	RCN = 77
Total Area =	6.07 acres	
Weighted RCN =	80	

#### **Offsite (from east of Bay Village Site)**

pervious area = (modeled as woods - C soils)	0.46 acres	RCN = 70
-------------------------------------------------	------------	----------

#### **Offsite (from south of Bay Village Site)**

impervious area ( C soils) =	0.00 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.00 acres	RCN = 74
pervious area = (modeled as woods - C soils)	0.00 acres	RCN = 70

#### **Bay Village Site (Lot 1) (taken from approved plans and computations)**

impervious area ( C soils) =	0.59 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.37 acres	RCN = 74

**Bay Village Site (Lot 2) (assumed future development of 85% impervious)**

impervious area ( C soils) =	0.43 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.08 acres	RCN = 74

**Bay Village Site (Lot 3) (taken from approved plans and computations)**

impervious area ( C soils) =	1.16 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.21 acres	RCN = 74
impervious area ( D soils) =	0.01 acres	RCN = 98
pervious area = (modeled as lawn - D soils)	0.02 acres	RCN = 80

**Bay Village Site (R.O.W.) (taken from approved plans and computations)**

impervious area ( C soils) =	0.71 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.29 acres	RCN = 74

**Offsite Area Between Lots 2 and 3**

impervious area ( C soils) =	0.23 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	0.17 acres	RCN = 74

**Bay Village Site (Developed Lot 4)**

impervious area =	1.77 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	1.08 acres	RCN = 74
pervious area = (modeled as woods - C soils)	1.17 acres	RCN = 70
pervious area = (modeled as lawn - D soils)	0.43 acres	RCN = 80
<b>Total Area =</b>	<b>15.25 acres</b>	
<b>Weighted RCN =</b>	<b>84</b>	

### **Bypass Area to Inlet #25**

impervious area =	1.01 acres	RCN = 98
pervious area = (modeled as lawn - C soils)	1.39 acres	RCN = 74
pervious area = (modeled as woods - C soils)	0.91 acres	RCN = 70
pervious area = (modeled as lawn - D soils)	0.58 acres	RCN = 80
pervious area = (modeled as woods - D soils)	0.37 acres	RCN = 77
<b>Total Area =</b>	<b>4.26 acres</b>	
<b>Weighted RCN =</b>	<b>80</b>	

BVDEV1A.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: DEVELOPED FLOW TO WETLAND DA #1A

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	3.3	67	.30	F					0.058
Sheet		33	.039	F					0.074
Shallow Concent'd		38	.078	U					0.002
Shallow Concent'd		937	.008	U					0.180
								Time of Concentration =	0.31*
									=====

--- Sheet Flow Surface Codes ---		--- Shallow Concentrated Surface Codes ---	
A Smooth Surface	F Grass, Dense		
B Fallow (No Res.)	G Grass, Burmuda		
C Cultivated < 20 % Res.	H Woods, Light		P Paved
D Cultivated > 20 % Res.	I Woods, Dense		U Unpaved
E Grass-Range, Short	J Range, Natural		

\* - Generated for use by GRAPHIC method  
 ♀ GRAPHICAL PEAK DISCHARGE METHOD                  Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: DEVELOPED FLOW TO WETLAND DA #1A

Data: Drainage Area : 11.7 Acres  
 Runoff Curve Number : 74  
 Time of Concentration: 0.31 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.26	0.21	0.16	0.14	0.12	0.11	0.09
Used	0.26	0.21	0.16	0.14	0.12	0.11	0.10
Runoff (in)	0.72	1.10	1.82	2.52	3.10	3.61	4.39
Unit Peak Discharge (cfs/acre/in)	0.914	0.951	0.991	1.013	1.026	1.035	1.041
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	8	12	21	30	37	44	54

\* - Value(s) provided from TR-55 system routines  
 Page 1

BVDEV1B.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: DEVELOPED DRAINAGE AREA #1B

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	wp (ft)	velocity (ft/sec)	Time (hr)
Sheet	3.3	64	.063	F					0.104
Sheet		36	.10	F					0.054
Shallow Concent'd		810	.017	U					0.107
Open Channel		692					3.5		0.055
								Time of Concentration =	0.32*
									=====

--- Sheet Flow Surface Codes ---				
A Smooth Surface	F Grass, Dense		--- Shallow Concentrated	---
B Fallow (No Res.)	G Grass, Burmuda		---	Surface Codes
C Cultivated < 20 % Res.	H Woods, Light		P Paved	
D Cultivated > 20 % Res.	I Woods, Dense		U Unpaved	
E Grass-Range, Short	J Range, Natural			

\* - Generated for use by GRAPHIC method

♀ GRAPHICAL PEAK DISCHARGE METHOD

Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: DEVELOPED DRAINAGE AREA #1B

Data: Drainage Area : 15.3 Acres  
 Runoff Curve Number : 84  
 Time of Concentration: 0.32 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.14	0.12	0.09	0.07	0.06	0.06	0.05
Used	0.14	0.12	0.10	0.10	0.10	0.10	0.10
Runoff (in)	1.27	1.77	2.64	3.45	4.10	4.67	5.52
Unit Peak Discharge (cfs/acre/in)	0.994	1.014	1.026	1.026	1.026	1.026	1.026
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	19	27	41	54	64	73	87

\* - value(s) provided from TR-55 system routines

BVBYP.PRN  
TIME OF CONCENTRATION AND TRAVEL TIME

Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: BYPASS AREA TO INLET 25

Flow Type	2 year rain	Length (ft)	slope (ft/ft)	Surface code	n	Area (sq/ft)	wp (ft)	velocity (ft/sec)	Time (hr)
Sheet	3.3	100	.05	H					0.244
Shallow Concent'd	194		.10	U					0.011
Shallow Concent'd	464		.02	U					0.056
Time of Concentration = 0.31*									=====

--- Sheet Flow Surface Codes ---		
A Smooth Surface	F Grass, Dense	--- Shallow Concentrated ---
B Fallow (No Res.)	G Grass, Burmuda	--- Surface Codes ---
C Cultivated < 20 % Res.	H Woods, Light	P Paved
D Cultivated > 20 % Res.	I Woods, Dense	U Unpaved
E Grass-Range, Short	J Range, Natural	

\* - Generated for use by GRAPHIC method

♀ GRAPHICAL PEAK DISCHARGE METHOD

Version 2.10

Project : BAY VILLAGE LOT 4                          User: JKC                  Date: 07-06-2015  
 County : ANNE ARUNDEL                          State: MD                          Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subtitle: BYPASS AREA TO INLET 25

Data: Drainage Area : 4.26 Acres  
 Runoff Curve Number : 80  
 Time of Concentration: 0.31 \* Hours  
 Rainfall Type : II  
 Pond and Swamp Area : NONE

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	1	2	5	10	25	50	100
24-Hr Rainfall (in)	2.7	3.3	4.3	5.2	5.9	6.5	7.4
Ia/P Ratio	0.19	0.15	0.12	0.10	0.08	0.08	0.07
Used	0.19	0.15	0.12	0.10	0.10	0.10	0.10
Runoff (in)	1.03	1.48	2.29	3.07	3.69	4.24	5.06
Unit Peak Discharge (cfs/acre/in)	0.973	1.000	1.028	1.041	1.041	1.041	1.041
Pond and Swamp Factor 0.0% Ponds Used	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Peak Discharge (cfs)	4	6	10	14	16	19	22

\* - Value(s) provided from TR-55 system routines

♀

**CALCULATE THE MODIFIED RCN FOR POST-DEV DRAINAGE AREAS  
BASED ON ESD PROVIDED TO THE MEP**  
**for 10 yr storm**

Development Bay Village Drive  
Location Anne Arundel County  
Job No. 05-1500

Date 12/03/15  
Computed by JKC

**POST-DEVELOPMENT DRAINAGE AREA #1B TO POND:**

Total storage in ESD devices within DA,  $V_{stored}$  = 7859 cf (ESD provided on Lot 4)  
Drainage area = 15.30 acres (DA containing ESD Devices)  
Runoff depth stored in ESD devices,  $Q_{stored}$  = 0.14 inches  
Post-development runoff depth,  $Q_{dev}$  = 3.45 inches (per TR55)  
 $Q = Q_{dev} - Q_{stored}$  = 3.31 inches  
 $P_{10}$  = 5.20 inches  
 $Modified\ CN^* = 200 / [(P+2Q+2) - (5PQ+4Q^2)^{1/2}]$  = 82.5  
Use CN\* = 83

# **CALCULATE THE MODIFIED RCN FOR POST-DEV DRAINAGE AREAS BASED ON ESD PROVIDED TO THE MEP**

**for 100 yr storm**

<i>Development</i>	Bay Village
<i>Location</i>	Anne Arundel County
<i>Job No.</i>	05-1500

Date 12/03/15  
Computed by JKC

### **POST-DEVELOPMENT DRAINAGE AREA TO POND:**

Total storage in ESD devices within DA, $V_{stored}$ =	7859	cf	(ESD provided on Lot 4)
Drainage area =	15.30	acres	(DA containing ESD Devices)
Runoff depth stored in ESD devices, $Q_{stored}$ =	0.14	inches	
Post-development runoff depth, $Q_{dev}$ =	5.52	inches (per TR55)	
$Q = Q_{dev} - Q_{stored}$ =	5.38	inches	
$P_{100}$ =	7.40	inches	
Modified CN* = $200 / [(P+2Q+2) - (5PQ+4Q^2)^{1/2}]$ =	82.8		
Use CN* =	83		

## BVDEV.OUT

♀

\*\*\*\*\*80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY\*\*\*\*\*

JOB	TR-20	001			SUMMARY	NO PLOTS	
TITLE	PROJECT:	JKC		DATE:12-3-15	BY:JC		
TITLE	FILENAME:		BVdev.DAT				
3 STRUCT	01						
8		50.0	0.000	0.000			
8		50.1	0.001	0.001			
8		51.0	0.002	2.065			
8		51.6	18.05	3.704			
8		51.8	64.24	4.317			
8		52.0	131.2	4.963			
8							
9 ENDTBL							
3 STRUCT	02						
8		37.6	0.000	0.000			
8		37.7	0.001	0.001			
8		38.0	0.154	0.140			
8		39.0	0.341	0.543			
8		40.0	0.456	0.997			
8		40.6	1.714	1.283			
8		41.0	3.131	1.475			
8		42.0	7.905	1.935			
8		42.6	11.45	2.163			
8		43.0	14.05	2.275			
8		44.0	20.65	2.584			
8		45.0	21.90	2.933			
8		45.6	22.88	3.241			
8		46.0	25.85	3.403			
8		47.0	29.83	3.841			
8		48.0	30.85	4.321			
8		49.0	31.82	4.806			
8							
9 ENDTBL							
6 RUNOFF	1	001	1	1 0.018	74.0	0.31	1 1 1 1 1 1 DA#1A
6 RESVOR	2	01	1	2 51.5			1 1 1 1 1 1 wetland
6 RUNOFF	1	002		3 0.0238	83.0	0.32	1 1 1 1 1 1 DA#1B
6 ADDHYD	4	003	2 3	4 37.6			1 1 1 1 1 1 #1A+#1B
6 RESVOR	2	02	4	5 37.6			1 1 1 1 1 1 EX POND
6 RUNOFF	1	004		6 0.0067	80.0	0.31	1 1 1 1 1 1 DABYP#1
6 ADDHYD	4	005	5 6	7			1 1 1 1 1 1 #1+BYP
ENDATA							
7 INCREM	6		0.05				
7 COMPUT	7	001	005	0.00	5.2	1.00	2 2 1 10
ENDCMP	1						
7 COMPUT	7	001	005	0.00	7.4	1.00	2 2 1 99
ENDCMP	1						
ENDJOB	2						

\*\*\*\*\*END OF 80-80 LIST\*\*\*\*\*

♀

TR20 -----	----- SCS -			
001	PROJECT: JKC	DATE:12-3-15	BY:JC	VERSION
12/09/**	FILENAME: BVdev.DAT			2.04TEST
10:24:09	PASS 1	JOB NO. 1		PAGE 1

EXECUTIVE CONTROL INCREM MAIN TIME INCREMENT = .050 HOURS  
Page 1

## BVDEV.OUT

EXECUTIVE CONTROL COMPUT FROM XSECTION 1 TO XSECTION 5  
 STARTING TIME = .00 RAIN DEPTH = 5.20 RAIN DURATION = 1.00  
 ANT. RUNOFF COND. = 2 MAIN TIME INCREMENT = .050 HOURS  
 ALTERNATE NO. = 1 STORM NO. =10 RAIN TABLE NO. = 2

OPERATION RUNOFF	XSECTION	1	PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET) (RUNOFF)			
			12.08	31.7				
HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10								
HRS	MAIN TIME INCREMENT =	.050 hr,	DRAINAGE AREA =	.02	SQ.MI.			
10.60 CFS	.47	.50	.54	.57	.61	.65	.69	.74
11.00 CFS	.79	.84	.90	.96	1.03	1.11	1.21	1.31
11.40 CFS	1.42	1.54	1.67	1.87	2.22	2.87	3.91	5.62
11.80 CFS	8.05	11.59	16.46	22.38	27.88	31.20	31.40	28.45
12.20 CFS	23.73	19.03	15.13	12.28	10.24	8.74	7.58	6.64
12.60 CFS	5.88	5.25	4.76	4.37	4.06	3.80	3.60	3.43
13.00 CFS	3.29	3.17	3.05	2.94	2.85	2.76	2.68	2.61
13.40 CFS	2.54	2.48	2.42	2.35	2.29	2.24	2.18	2.13
13.80 CFS	2.08	2.03	1.99	1.94	1.90	1.86	1.81	1.78
14.20 CFS	1.74	1.71	1.69	1.67	1.65	1.63	1.61	1.60
14.60 CFS	1.58	1.57	1.55	1.53	1.52	1.50	1.49	1.47
15.00 CFS	1.46	1.44	1.43	1.41	1.40	1.38	1.37	1.35
15.40 CFS	1.34	1.32	1.31	1.29	1.28	1.26	1.25	1.23
15.80 CFS	1.21	1.20	1.18	1.17	1.15	1.14	1.12	1.11
16.20 CFS	1.10	1.08	1.08	1.07	1.06	1.05	1.05	1.04
16.60 CFS	1.04	1.03	1.03	1.02	1.01	1.01	1.00	1.00
17.00 CFS	.99	.99	.98	.98	.97	.97	.96	.95
17.40 CFS	.95	.94	.94	.93	.93	.92	.92	.91
17.80 CFS	.90	.90	.89	.89	.88	.88	.87	.86
18.20 CFS	.86	.85	.85	.84	.84	.83	.83	.82
18.60 CFS	.81	.81	.80	.80	.79	.79	.78	.77
19.00 CFS	.77	.76	.76	.75	.75	.74	.73	.73
19.40 CFS	.72	.72	.71	.70	.70	.69	.69	.68
19.80 CFS	.68	.67	.66	.66	.65	.65	.64	.64
20.20 CFS	.63	.63	.63	.62	.62	.62	.62	.62
20.60 CFS	.62	.62	.61	.61	.61	.61	.61	.61
21.00 CFS	.61	.61	.61	.60	.60	.60	.60	.60
21.40 CFS	.60	.60	.60	.60	.59	.59	.59	.59
21.80 CFS	.59	.59	.59	.59	.59	.58	.58	.58
22.20 CFS	.58	.58	.58	.58	.58	.58	.58	.57
22.60 CFS	.57	.57	.57	.57	.57	.57	.57	.57
23.00 CFS	.56	.56	.56	.56	.56	.56	.56	.56
23.40 CFS	.56	.55	.55	.55	.55	.55	.55	.55

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 1 JOB NO. 1 PAGE 2

23.80 CFS .55 .55 .54 .54 .54 .53 .48

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 2.52 WATERSHED INCHES; 29 CFS-HRS; 2.4 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	13
FLOW(CFS)	2	1	1	1	1	1	0

BVDEV.OUT

--- XSECTION 1, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

\*\*\* MESSAGE - STRUCTURE 1, USER ENTERED STARTING ELEVATION ( 51.5 FEET) CAN ADD 3.574 INCHES OF RUNOFF TO THE OUTFLOW HYDROGRAPH VOLUME.\*\*\*

\*\*\* MESSAGE - RESERVOIR ROUTING, STRUCTURE 1, TRUNCATED AT 400 POINTS WITH 2.06 AC-FT (.18 WATERSHED INCHES) FLOOD STORAGE REMAINING IN RESERVOIR AT ELEV. 51.00. \*\*\*

OPERATION RESVOR      STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
8.60	15.0	51.50
12.41	9.9	51.33

HRS	HYDROGRAPH POINTS FOR			ALTERNATE = 1, STORM =10		DRAINAGE AREA = .02	SQ.MI.	
	MAIN TIME	INCREMENT = .050	hr,					
8.60 CFS	15.04	14.37	13.73	13.12	12.54	11.98	11.45	10.94
9.00 CFS	10.45	9.99	9.55	9.12	8.72	8.34	7.97	7.62
9.40 CFS	7.28	6.96	6.66	6.37	6.09	5.82	5.57	5.33
9.80 CFS	5.10	4.88	4.67	4.47	4.28	4.10	3.93	3.77
10.20 CFS	3.61	3.46	3.32	3.19	3.07	2.95	2.83	2.73
10.60 CFS	2.63	2.53	2.44	2.36	2.28	2.21	2.14	2.07
11.00 CFS	2.02	1.96	1.91	1.87	1.83	1.80	1.77	1.75
11.40 CFS	1.73	1.72	1.71	1.72	1.73	1.77	1.84	1.97
11.80 CFS	2.19	2.53	3.04	3.77	4.72	5.82	6.95	7.98
12.20 CFS	8.78	9.34	9.69	9.87	9.93	9.91	9.83	9.71
12.60 CFS	9.56	9.38	9.18	8.98	8.77	8.55	8.34	8.12
13.00 CFS	7.91	7.70	7.50	7.30	7.10	6.91	6.72	6.54
13.40 CFS	6.37	6.19	6.03	5.87	5.71	5.55	5.41	5.26
13.80 CFS	5.12	4.98	4.85	4.72	4.60	4.48	4.36	4.25
14.20 CFS	4.14	4.03	3.92	3.82	3.73	3.64	3.55	3.46
14.60 CFS	3.38	3.30	3.22	3.14	3.07	3.00	2.94	2.87
15.00 CFS	2.81	2.75	2.69	2.63	2.58	2.53	2.47	2.43
15.40 CFS	2.38	2.33	2.29	2.24	2.20	2.16	2.12	2.08
15.80 CFS	2.04	2.00	1.97	1.93	1.90	1.86	1.83	1.80
16.20 CFS	1.77	1.74	1.71	1.68	1.65	1.63	1.60	1.58
16.60 CFS	1.55	1.53	1.51	1.49	1.46	1.44	1.42	1.41
17.00 CFS	1.39	1.37	1.35	1.34	1.32	1.30	1.29	1.27
17.40 CFS	1.26	1.25	1.23	1.22	1.21	1.19	1.18	1.17
17.80 CFS	1.16	1.15	1.14	1.12	1.11	1.10	1.09	1.08
18.20 CFS	1.07	1.06	1.05	1.04	1.04	1.03	1.02	1.01

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TR20	PROJECT:	JKC	DATE:12-3-15	BY:JC	SCS -
001	FILENAME:		BVdev.DAT		VERSION
12/09/**	PASS	1	JOB NO.	1	2.04TEST
10:24:09					PAGE 3

18.60 CFS	1.00	.99	.98	.98	.97	.96	.95	.94
19.00 CFS	.94	.93	.92	.91	.91	.90	.89	.88
19.40 CFS	.88	.87	.86	.86	.85	.84	.84	.83
19.80 CFS	.82	.82	.81	.80	.80	.79	.78	.78
20.20 CFS	.77	.76	.76	.75	.75	.74	.74	.73
20.60 CFS	.73	.72	.72	.71	.71	.70	.70	.69
21.00 CFS	.69	.69	.68	.68	.68	.67	.67	.67
21.40 CFS	.66	.66	.66	.66	.65	.65	.65	.65
21.80 CFS	.64	.64	.64	.64	.63	.63	.63	.63
22.20 CFS	.63	.62	.62	.62	.62	.62	.61	.61
22.60 CFS	.61	.61	.61	.61	.60	.60	.60	.60
23.00 CFS	.60	.60	.59	.59	.59	.59	.59	.59
23.40 CFS	.59	.58	.58	.58	.58	.58	.58	.58

	BVDEV.OUT							
23.80 CFS	.58	.57	.57	.57	.57	.57	.57	.56
24.20 CFS	.55	.54	.52	.50	.49	.47	.45	.43
24.60 CFS	.41	.39	.38	.36	.34	.33	.31	.30
25.00 CFS	.29	.27	.26	.25	.24	.23	.22	.21
25.40 CFS	.20	.19	.18	.17	.17	.16	.15	.14
25.80 CFS	.14	.13	.13	.12	.12	.11	.11	.10
26.20 CFS	.10	.09	.09	.08	.08	.08	.07	.07
26.60 CFS	.07	.06	.06	.06	.06	.05	.05	.05
27.00 CFS	.05	.04	.04	.04	.04	.04	.04	.03
27.40 CFS	.03	.03	.03	.03	.03	.03	.02	.02
27.80 CFS	.02	.02	.02	.02	.02	.02	.02	.02
28.20 CFS	.02	.01	.01	.01	.01	.01	.01	.01

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.94 WATERSHED INCHES; 46 CFS-HRS; 3.8 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	7	4	2	2	1	1	1	0

--- STRUCTURE 1, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 2

PEAK TIME(HRS)	12.08	PEAK DISCHARGE(CFS)	55.1	PEAK ELEVATION(FEET)	(RUNOFF)
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HRS	MAIN	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	STORM = 10	DRAINAGE AREA = .02 SQ.MI.		
		TIME	INCREMENT = .050 hr,					
8.75 CFS	.49	.50	.52	.54	.56	.59	.61	.63
9.15 CFS	.65	.67	.69	.70	.72	.73	.74	.76
9.55 CFS	.77	.79	.80	.82	.84	.87	.90	.93
9.95 CFS	.96	.99	1.03	1.07	1.11	1.15	1.19	1.24
10.35 CFS	1.29	1.35	1.40	1.46	1.52	1.58	1.64	1.71
10.75 CFS	1.79	1.88	1.96	2.06	2.15	2.26	2.36	2.48
11.15 CFS	2.61	2.76	2.93	3.12	3.33	3.56	3.79	4.06
11.55 CFS	4.45	5.16	6.44	8.49	11.70	16.17	22.38	30.59
11.95 CFS	40.20	49.26	54.45	54.46	49.25	41.24	33.05	26.01

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 1 JOB NO. 1 PAGE 4

12.35 CFS	21.07	17.52	14.82	12.72	11.05	9.71	8.64	7.78
12.75 CFS	7.10	6.56	6.12	5.76	5.47	5.22	5.01	4.82
13.15 CFS	4.64	4.48	4.34	4.21	4.09	3.98	3.88	3.78
13.55 CFS	3.68	3.58	3.49	3.40	3.32	3.24	3.17	3.09
13.95 CFS	3.02	2.95	2.88	2.82	2.76	2.70	2.65	2.61
14.35 CFS	2.58	2.55	2.52	2.49	2.46	2.44	2.41	2.39
14.75 CFS	2.36	2.34	2.32	2.29	2.27	2.24	2.22	2.20
15.15 CFS	2.17	2.15	2.12	2.10	2.08	2.05	2.03	2.00
15.55 CFS	1.98	1.96	1.93	1.91	1.88	1.86	1.83	1.81
15.95 CFS	1.78	1.76	1.74	1.71	1.69	1.67	1.66	1.64
16.35 CFS	1.63	1.62	1.61	1.60	1.59	1.58	1.57	1.56
16.75 CFS	1.55	1.54	1.53	1.53	1.52	1.51	1.50	1.49
17.15 CFS	1.48	1.47	1.47	1.46	1.45	1.44	1.43	1.42
17.55 CFS	1.41	1.40	1.40	1.39	1.38	1.37	1.36	1.35
17.95 CFS	1.34	1.33	1.33	1.32	1.31	1.30	1.29	1.28
18.35 CFS	1.27	1.26	1.26	1.25	1.24	1.23	1.22	1.21
18.75 CFS	1.20	1.19	1.19	1.18	1.17	1.16	1.15	1.14
19.15 CFS	1.13	1.12	1.12	1.11	1.10	1.09	1.08	1.07

			BVDEV	OUT					
19.55 CFS	1.06	1.05	1.04	1.04	1.03	1.02	1.01	1.00	
19.95 CFS	.99	.98	.97	.97	.96	.95	.95	.94	
20.35 CFS	.94	.93	.93	.93	.93	.93	.92	.92	
20.75 CFS	.92	.92	.92	.92	.91	.91	.91	.91	
21.15 CFS	.91	.90	.90	.90	.90	.90	.90	.89	
21.55 CFS	.89	.89	.89	.89	.89	.88	.88	.88	
21.95 CFS	.88	.88	.88	.87	.87	.87	.87	.87	
22.35 CFS	.87	.86	.86	.86	.86	.86	.85	.85	
22.75 CFS	.85	.85	.85	.85	.84	.84	.84	.84	
23.15 CFS	.84	.84	.83	.83	.83	.83	.83	.83	
23.55 CFS	.82	.82	.82	.82	.82	.81	.81	.81	
23.95 CFS	.81	.81	.78	.72	.62	.48			

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.35 WATERSHED INCHES; 51 CFS-HRS; 4.3 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	4	2	2	1	1	1	1	0

--- XSECTION 2, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
8.62	17.1	(NULL)
12.09	61.6	(NULL)

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =10  
 HRS MAIN TIME INCREMENT = .050 hr, DRAINAGE AREA = .04 SQ.MI.  
 8.55 CFS .41 15.47 14.82 14.20 13.61 13.04 12.50 11.99  
 8.95 CFS 11.50 11.04 10.60 10.18 9.77 9.39 9.02 8.67  
 9.35 CFS 8.33 8.01 7.71 7.42 7.14 6.87 6.62 6.39

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 1 JOB NO. 1 PAGE 5

9.75 CFS	6.17	5.97	5.78	5.60	5.43	5.28	5.13	5.00
10.15 CFS	4.87	4.76	4.66	4.57	4.48	4.41	4.35	4.29
10.55 CFS	4.24	4.20	4.17	4.16	4.15	4.15	4.17	4.19
10.95 CFS	4.23	4.27	4.33	4.39	4.48	4.59	4.72	4.89
11.35 CFS	5.08	5.29	5.51	5.77	6.17	6.89	8.21	10.33
11.75 CFS	13.67	18.35	24.91	33.63	43.97	53.98	60.27	61.41
12.15 CFS	57.23	50.02	42.40	35.70	30.94	27.45	24.73	22.55
12.55 CFS	20.76	19.26	18.02	16.97	16.08	15.32	14.67	14.10
12.95 CFS	13.59	13.13	12.71	12.31	11.94	11.58	11.25	10.94
13.35 CFS	10.64	10.35	10.07	9.81	9.54	9.29	9.05	8.81
13.75 CFS	8.58	8.36	8.15	7.95	7.74	7.55	7.36	7.18
14.15 CFS	7.00	6.84	6.68	6.54	6.40	6.27	6.15	6.03
14.55 CFS	5.92	5.81	5.71	5.61	5.51	5.41	5.32	5.23
14.95 CFS	5.14	5.05	4.97	4.89	4.81	4.73	4.65	4.57
15.35 CFS	4.50	4.43	4.36	4.29	4.22	4.15	4.09	4.02
15.75 CFS	3.96	3.90	3.84	3.78	3.72	3.66	3.60	3.54
16.15 CFS	3.49	3.44	3.39	3.35	3.31	3.27	3.23	3.20
16.55 CFS	3.16	3.13	3.10	3.07	3.04	3.01	2.98	2.95
16.95 CFS	2.92	2.90	2.87	2.84	2.82	2.79	2.77	2.75
17.35 CFS	2.72	2.70	2.68	2.65	2.63	2.61	2.59	2.57
17.75 CFS	2.55	2.53	2.51	2.49	2.47	2.45	2.43	2.41
18.15 CFS	2.39	2.37	2.35	2.34	2.32	2.30	2.28	2.27
18.55 CFS	2.25	2.23	2.21	2.20	2.18	2.16	2.15	2.13

			BVDEV	OUT				
18.95 CFS	2.11	2.10	2.08	2.06	2.05	2.03	2.01	2.00
19.35 CFS	1.98	1.97	1.95	1.93	1.92	1.90	1.89	1.87
19.75 CFS	1.86	1.84	1.83	1.81	1.79	1.78	1.76	1.75
20.15 CFS	1.73	1.72	1.71	1.70	1.69	1.68	1.67	1.67
20.55 CFS	1.66	1.65	1.64	1.64	1.63	1.63	1.62	1.61
20.95 CFS	1.61	1.60	1.60	1.59	1.59	1.58	1.58	1.57
21.35 CFS	1.57	1.56	1.56	1.55	1.55	1.54	1.54	1.54
21.75 CFS	1.53	1.53	1.52	1.52	1.52	1.51	1.51	1.50
22.15 CFS	1.50	1.50	1.49	1.49	1.48	1.48	1.48	1.47
22.55 CFS	1.47	1.47	1.46	1.46	1.46	1.45	1.45	1.45
22.95 CFS	1.44	1.44	1.44	1.43	1.43	1.43	1.42	1.42
23.35 CFS	1.42	1.41	1.41	1.41	1.41	1.40	1.40	1.40
23.75 CFS	1.39	1.39	1.39	1.38	1.38	1.38	1.35	1.29
24.15 CFS	1.18	1.03	.89	.76	.67	.60	.54	.50

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.61 WATERSHED INCHES; 97 CFS-HRS; 8.1 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	11	6	4	3	2	2	1	0

--- XSECTION 3, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 2  
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TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 1 JOB NO. 1 PAGE 6

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.51	22.1	45.14

HRS	MAIN	HYDROGRAPH POINTS FOR	ALTERNATE = 1,	STORM =10		
		TIME INCREMENT = .050 hr,	DRAINAGE AREA = .04	SQ.MI.		
7.05 CFS	.00	.01	.01	.01	.01	.01
7.45 CFS	.01	.01	.01	.01	.01	.02
7.85 CFS	.02	.02	.02	.02	.02	.03
8.25 CFS	.03	.03	.03	.03	.03	.04
8.65 CFS	.14	.18	.20	.23	.25	.30
9.05 CFS	.34	.35	.36	.37	.38	.40
9.45 CFS	.41	.42	.43	.43	.44	.45
9.85 CFS	.59	.68	.77	.85	.93	1.00
10.25 CFS	1.21	1.27	1.33	1.38	1.44	1.49
10.65 CFS	1.63	1.68	1.73	1.80	1.88	1.94
11.05 CFS	2.15	2.21	2.28	2.35	2.42	2.49
11.45 CFS	2.72	2.81	2.91	3.02	3.16	3.42
11.85 CFS	5.02	6.04	7.41	9.76	13.30	17.38
12.25 CFS	21.55	21.81	21.97	22.06	22.11	22.13
12.65 CFS	22.05	22.00	21.92	21.84	21.73	21.63
13.05 CFS	21.27	21.14	21.01	20.87	20.73	20.31
13.45 CFS	18.02	17.34	16.69	16.08	15.49	14.94
13.85 CFS	13.38	12.89	12.43	11.99	11.58	11.27
14.25 CFS	10.50	10.26	10.03	9.80	9.57	9.36
14.65 CFS	8.74	8.55	8.37	8.18	8.01	7.86
15.05 CFS	7.53	7.42	7.31	7.20	7.10	6.99
15.45 CFS	6.69	6.59	6.49	6.39	6.30	6.20
15.85 CFS	5.93	5.84	5.75	5.67	5.58	5.50
16.25 CFS	5.25	5.17	5.09	5.02	4.94	4.87
16.65 CFS	4.66	4.60	4.53	4.47	4.41	4.35

					BVDEV.OUT			
17.05 CFS	4.17	4.12	4.06	4.01	3.96	3.91	3.86	3.81
17.45 CFS	3.76	3.72	3.67	3.63	3.59	3.54	3.50	3.46
17.85 CFS	3.42	3.38	3.34	3.31	3.27	3.24	3.20	3.17
18.25 CFS	3.13	3.11	3.08	3.06	3.04	3.02	2.99	2.97
18.65 CFS	2.95	2.93	2.90	2.88	2.86	2.84	2.82	2.79
19.05 CFS	2.77	2.75	2.73	2.71	2.69	2.67	2.65	2.63
19.45 CFS	2.61	2.59	2.57	2.55	2.53	2.51	2.49	2.47
19.85 CFS	2.45	2.43	2.41	2.40	2.38	2.36	2.34	2.32
20.25 CFS	2.30	2.28	2.27	2.25	2.23	2.22	2.20	2.18
20.65 CFS	2.17	2.15	2.14	2.12	2.10	2.09	2.08	2.06
21.05 CFS	2.05	2.03	2.02	2.01	1.99	1.98	1.97	1.96
21.45 CFS	1.95	1.93	1.92	1.91	1.90	1.89	1.88	1.87
21.85 CFS	1.86	1.85	1.84	1.83	1.82	1.81	1.80	1.79
22.25 CFS	1.78	1.77	1.76	1.76	1.75	1.74	1.73	1.72
22.65 CFS	1.72	1.71	1.71	1.70	1.70	1.69	1.69	1.68
23.05 CFS	1.68	1.67	1.67	1.67	1.66	1.66	1.65	1.65
23.45 CFS	1.64	1.64	1.64	1.63	1.63	1.62	1.62	1.62
23.85 CFS	1.61	1.61	1.60	1.60	1.60	1.59	1.58	1.57
24.25 CFS	1.56	1.55	1.54	1.52	1.50	1.48	1.47	1.45
24.65 CFS	1.43	1.41	1.39	1.37	1.35	1.34	1.32	1.30

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 1 JOB NO. 1 PAGE 7  
 25.05 CFS 1.28 1.26 1.24 1.23 1.21 1.19 1.17 1.16  
 25.45 CFS 1.14 1.12 1.10 1.09 1.07 1.05 1.04 1.02  
 25.85 CFS 1.01  
 RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.11 WATERSHED INCHES; 84 CFS-HRS; 6.9 ACRE-FEET.  
 DURATION(HRS) 2 4 6 8 10 12 14  
 FLOW(CFS) 12 6 4 3 2 2 1 TRUNCATED

--- STRUCTURE 2, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 4  
 PEAK TIME(HRS) 12.07 PEAK DISCHARGE(CFS) 14.5 PEAK ELEVATION(FEET)  
 (RUNOFF)  
 HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM = 10  
 HRS MAIN TIME INCREMENT = .050 hr, DRAINAGE AREA = .01 SQ.MI.  
 10.95 CFS .49 .51 .54 .57 .60 .64 .68 .73  
 11.35 CFS .78 .84 .90 .96 1.06 1.23 1.57 2.12  
 11.75 CFS 2.96 4.10 5.72 7.91 10.52 12.91 14.36 14.24  
 12.15 CFS 12.74 10.57 8.40 6.61 5.36 4.47 3.78 3.26  
 12.55 CFS 2.84 2.51 2.24 2.02 1.85 1.71 1.61 1.52  
 12.95 CFS 1.45 1.38 1.33 1.28 1.24 1.19 1.16 1.12  
 13.35 CFS 1.09 1.06 1.04 1.01 .98 .96 .93 .91  
 13.75 CFS .89 .87 .85 .83 .81 .79 .77 .75  
 14.15 CFS .74 .72 .71 .70 .69 .68 .68 .67  
 14.55 CFS .66 .66 .65 .64 .64 .63 .62 .62  
 14.95 CFS .61 .60 .60 .59 .58 .58 .57 .57  
 15.35 CFS .56 .55 .55 .54 .53 .53 .52 .51  
 15.75 CFS .51 .50 .49

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.07 WATERSHED INCHES; 13 CFS-HRS; 1.1 ACRE-FEET.  
 Page 7

## BVDEV.OUT

DURATION(HRS)	2	4	5
FLOW(CFS)	1	1	0

--- XSECTION 4, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 5

PEAK TIME(HRS)		PEAK DISCHARGE(CFS)		PEAK ELEVATION(FEET)	
12.15		33.4		(NULL)	

HRS	MAIN	TIME	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	STORM =10	DRAINAGE AREA = .05 SQ.MI.		
			INCREMENT	.050 hr,					
9.20 CFS		.49	.51	.52	.53	.54	.56	.57	.58
9.60 CFS		.59	.60	.61	.62	.67	.77	.87	.97
10.00 CFS		1.06	1.15	1.23	1.31	1.39	1.46	1.53	1.61

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TR20 ----- SCS -				
001	PROJECT: JKC	DATE: 12-3-15	BY: JC	VERSION
12/09/**	FILENAME: BVdev.DAT			2.04TEST
10:24:09	PASS 1	JOB NO. 1		PAGE 8

10.40 CFS	1.67	1.74	1.81	1.87	1.93	2.00	2.06	2.13
10.80 CFS	2.22	2.32	2.41	2.50	2.59	2.69	2.78	2.88
11.20 CFS	2.98	3.10	3.22	3.34	3.48	3.62	3.78	3.97
11.60 CFS	4.25	4.73	5.54	6.74	8.39	10.74	13.95	17.93
12.00 CFS	22.67	27.66	31.62	33.44	31.75	29.95	28.42	27.33
12.40 CFS	26.53	25.90	25.39	24.97	24.61	24.30	24.02	23.77
12.80 CFS	23.55	23.34	23.15	22.96	22.78	22.60	22.42	22.24
13.20 CFS	22.07	21.89	21.43	20.60	19.81	19.06	18.35	17.67
13.60 CFS	17.03	16.43	15.85	15.30	14.76	14.23	13.72	13.24
14.00 CFS	12.78	12.35	12.02	11.75	11.48	11.22	10.96	10.72
14.40 CFS	10.48	10.25	10.03	9.81	9.60	9.39	9.19	9.00
14.80 CFS	8.81	8.63	8.48	8.36	8.24	8.12	8.01	7.89
15.20 CFS	7.78	7.67	7.56	7.45	7.34	7.23	7.13	7.02
15.60 CFS	6.92	6.82	6.72	6.62	6.52	6.42	6.33	6.23
16.00 CFS	6.14	6.05	5.96	5.87	5.78	5.70	5.61	5.53
16.40 CFS	5.45	5.38	5.30	5.23	5.16	5.09	5.02	4.95
16.80 CFS	4.89	4.82	4.76	4.70	4.64	4.58	4.52	4.46
17.20 CFS	4.41	4.36	4.30	4.25	4.20	4.15	4.10	4.05
17.60 CFS	4.01	3.96	3.92	3.87	3.83	3.79	3.75	3.71
18.00 CFS	3.67	3.63	3.59	3.55	3.52	3.48	3.46	3.43
18.40 CFS	3.40	3.38	3.35	3.33	3.30	3.28	3.25	3.23
18.80 CFS	3.20	3.18	3.16	3.13	3.11	3.09	3.06	3.04
19.20 CFS	3.02	2.99	2.97	2.95	2.92	2.90	2.88	2.86
19.60 CFS	2.83	2.81	2.79	2.77	2.75	2.73	2.70	2.68
20.00 CFS	2.66	2.64	2.62	2.60	2.58	2.56	2.54	2.52
20.40 CFS	2.50	2.49	2.47	2.45	2.43	2.42	2.40	2.38
20.80 CFS	2.37	2.35	2.34	2.32	2.31	2.29	2.28	2.27
21.20 CFS	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.16
21.60 CFS	2.15	2.14	2.13	2.12	2.11	2.10	2.09	2.08
22.00 CFS	2.07	2.06	2.05	2.04	2.03	2.02	2.01	2.00
22.40 CFS	1.99	1.98	1.97	1.96	1.96	1.95	1.94	1.94
22.80 CFS	1.93	1.93	1.92	1.92	1.91	1.91	1.90	1.90
23.20 CFS	1.89	1.89	1.88	1.88	1.87	1.87	1.86	1.86
23.60 CFS	1.86	1.85	1.85	1.84	1.84	1.83	1.83	1.82
24.00 CFS	1.82	1.81	1.79	1.75	1.70	1.65	1.61	1.58
24.40 CFS	1.55	1.52	1.50	1.47	1.45	1.43	1.41	1.39
24.80 CFS	1.37	1.35	1.34	1.32	1.30	1.28	1.26	1.24
25.20 CFS	1.23	1.21	1.19	1.17	1.16	1.14	1.12	1.10
25.60 CFS	1.09	1.07	1.05	1.04	1.02	1.01		

## BVDEV.OUT

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 3.11 WATERSHED INCHES; 97 CFS-HRS; 8.0 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	14
FLOW(CFS)	14	7	4	3	2	2	2	1 TRUNCATED

--- XSECTION 5, ALTERNATE 1, STORM 10, HYDROGRAPH ADDED TO READHD FILE ---  
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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 2 JOB NO. 1 PAGE 9

EXECUTIVE CONTROL ENDCMP COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL COMPUT FROM XSECTION 1 TO XSECTION 5  
 STARTING TIME = .00 RAIN DEPTH = 7.40 RAIN DURATION = 1.00  
 ANT. RUNOFF COND. = 2 MAIN TIME INCREMENT = .050 HOURS  
 ALTERNATE NO. = 1 STORM NO. = 99 RAIN TABLE NO. = 2

OPERATION RUNOFF XSECTION 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.07	55.3	(RUNOFF)

HRS	MAIN	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	DRAINAGE AREA =	STORM = 99	.02 SQ.MI.		
		TIME	INCREMENT = .050 hr,						
9.20	CFS	.49	.51	.53	.54	.55	.57	.58	.60
9.60	CFS	.61	.63	.64	.67	.69	.72	.75	.78
10.00	CFS	.81	.84	.87	.91	.95	.99	1.04	1.08
10.40	CFS	1.13	1.18	1.24	1.29	1.35	1.41	1.48	1.55
10.80	CFS	1.63	1.72	1.80	1.90	1.99	2.09	2.20	2.33
11.20	CFS	2.47	2.64	2.82	3.02	3.24	3.47	3.72	4.11
11.60	CFS	4.81	6.09	8.14	11.38	15.90	22.22	30.69	40.70
12.00	CFS	49.72	54.78	54.47	48.89	40.51	32.29	25.53	20.62
12.40	CFS	17.10	14.50	12.52	10.93	9.64	8.58	7.75	7.10
12.80	CFS	6.58	6.16	5.82	5.55	5.31	5.11	4.91	4.74
13.20	CFS	4.58	4.44	4.31	4.19	4.08	3.97	3.87	3.77
13.60	CFS	3.67	3.58	3.49	3.41	3.33	3.25	3.18	3.10
14.00	CFS	3.03	2.96	2.89	2.83	2.78	2.73	2.69	2.65
14.40	CFS	2.62	2.59	2.56	2.54	2.51	2.49	2.46	2.44
14.80	CFS	2.41	2.39	2.36	2.34	2.32	2.29	2.27	2.24
15.20	CFS	2.22	2.19	2.17	2.14	2.12	2.09	2.07	2.04
15.60	CFS	2.02	1.99	1.97	1.94	1.92	1.89	1.87	1.84
16.00	CFS	1.82	1.79	1.77	1.75	1.73	1.71	1.70	1.68
16.40	CFS	1.67	1.66	1.65	1.64	1.63	1.62	1.62	1.61
16.80	CFS	1.60	1.59	1.58	1.57	1.56	1.55	1.54	1.54
17.20	CFS	1.53	1.52	1.51	1.50	1.49	1.48	1.47	1.46
17.60	CFS	1.46	1.45	1.44	1.43	1.42	1.41	1.40	1.39
18.00	CFS	1.38	1.38	1.37	1.36	1.35	1.34	1.33	1.32
18.40	CFS	1.31	1.30	1.29	1.29	1.28	1.27	1.26	1.25
18.80	CFS	1.24	1.23	1.22	1.21	1.20	1.19	1.19	1.18
19.20	CFS	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10
19.60	CFS	1.09	1.08	1.08	1.07	1.06	1.05	1.04	1.03
20.00	CFS	1.02	1.01	1.00	.99	.99	.98	.98	.97
20.40	CFS	.97	.97	.97	.96	.96	.96	.96	.96
20.80	CFS	.96	.95	.95	.95	.95	.95	.94	.94

BVDEV.OUT

21.20 CFS	.94	.94	.94	.94	.93	.93	.93	.93
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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC  
 12/09/\*\* FILENAME: BVdev.DAT VERSION  
 10:24:09 PASS 2 JOB NO. 1 2.04TEST  
 PAGE 10

21.60 CFS	.93	.93	.92	.92	.92	.92	.92	.91
22.00 CFS	.91	.91	.91	.91	.91	.90	.90	.90
22.40 CFS	.90	.90	.90	.89	.89	.89	.89	.89
22.80 CFS	.88	.88	.88	.88	.88	.88	.87	.87
23.20 CFS	.87	.87	.87	.87	.86	.86	.86	.86
23.60 CFS	.86	.85	.85	.85	.85	.85	.85	.84
24.00 CFS	.84	.82	.75	.63	.48			

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.39 WATERSHED INCHES; 51 CFS-HRS; 4.2 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
FLOW(CFS)	4	2	2	1	1	1	1	0

--- XSECTION 1, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

\*\*\* MESSAGE - STRUCTURE 1, USER ENTERED STARTING ELEVATION ( 51.5 FEET) CAN ADD 3.574 INCHES OF RUNOFF TO THE OUTFLOW HYDROGRAPH VOLUME. \*\*\*

\*\*\* MESSAGE - RESERVOIR ROUTING, STRUCTURE 1, TRUNCATED AT 400 POINTS WITH 2.07 AC-FT (.18 WATERSHED INCHES) FLOOD STORAGE REMAINING IN RESERVOIR AT ELEV. 51.00. \*\*\*

OPERATION RESVOR STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.70	15.0	51.50
12.41	17.0	51.57

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM = 99		
HRS	MAIN TIME	INCREMENT = .050 hr, DRAINAGE AREA = .02 SQ.MI.
6.70 CFS	15.04	14.37 13.73 13.12 12.54 11.98 11.45 10.94
7.10 CFS	10.45	9.99 9.54 9.12 8.72 8.33 7.96 7.61
7.50 CFS	7.27	6.95 6.65 6.36 6.08 5.81 5.56 5.32
7.90 CFS	5.09	4.86 4.65 4.45 4.26 4.08 3.91 3.74
8.30 CFS	3.58	3.43 3.29 3.15 3.02 2.90 2.78 2.67
8.70 CFS	2.57	2.47 2.37 2.28 2.20 2.12 2.04 1.97
9.10 CFS	1.90	1.84 1.78 1.72 1.67 1.62 1.57 1.53
9.50 CFS	1.48	1.44 1.41 1.37 1.34 1.31 1.28 1.25
9.90 CFS	1.23	1.21 1.19 1.17 1.16 1.15 1.14 1.13
10.30 CFS	1.13	1.12 1.12 1.12 1.13 1.13 1.14 1.15
10.70 CFS	1.17	1.18 1.20 1.22 1.24 1.27 1.30 1.33
11.10 CFS	1.37	1.41 1.45 1.50 1.56 1.62 1.69 1.76
11.50 CFS	1.84	1.93 2.05 2.20 2.42 2.74 3.23 3.93
11.90 CFS	4.93	6.30 8.03 10.00 11.99 13.75 15.13 16.08
12.30 CFS	16.65	16.93 17.02 16.96 16.81 16.58 16.30 15.98
12.70 CFS	15.64	15.27 14.90 14.52 14.14 13.76 13.39 13.03
13.10 CFS	12.67	12.32 11.98 11.65 11.32 11.01 10.70 10.41
13.50 CFS	10.12	9.84 9.57 9.30 9.05 8.80 8.55 8.32
13.90 CFS	8.09	7.87 7.66 7.45 7.25 7.05 6.87 6.68

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 Page 10

12/09/\*\*  
 10:24:09

BVDEV.OUT

	FILENAME:		BVdev.DAT				2.04TEST	
	PASS	2	JOB NO.	1			PAGE	11
14.30 CFS	6.51	6.34	6.17	6.01	5.86	5.71	5.57	5.43
14.70 CFS	5.30	5.18	5.05	4.94	4.82	4.71	4.61	4.50
15.10 CFS	4.40	4.31	4.22	4.13	4.04	3.96	3.87	3.80
15.50 CFS	3.72	3.65	3.57	3.50	3.44	3.37	3.31	3.24
15.90 CFS	3.18	3.12	3.07	3.01	2.96	2.90	2.85	2.80
16.30 CFS	2.75	2.70	2.66	2.62	2.57	2.53	2.49	2.45
16.70 CFS	2.42	2.38	2.35	2.31	2.28	2.25	2.22	2.19
17.10 CFS	2.16	2.13	2.11	2.08	2.06	2.03	2.01	1.98
17.50 CFS	1.96	1.94	1.92	1.90	1.88	1.86	1.84	1.82
17.90 CFS	1.80	1.78	1.77	1.75	1.73	1.72	1.70	1.68
18.30 CFS	1.67	1.65	1.64	1.62	1.61	1.59	1.58	1.57
18.70 CFS	1.55	1.54	1.53	1.51	1.50	1.49	1.48	1.46
19.10 CFS	1.45	1.44	1.43	1.42	1.40	1.39	1.38	1.37
19.50 CFS	1.36	1.35	1.34	1.32	1.31	1.30	1.29	1.28
19.90 CFS	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20
20.30 CFS	1.19	1.18	1.17	1.16	1.15	1.14	1.14	1.13
20.70 CFS	1.12	1.11	1.11	1.10	1.09	1.09	1.08	1.08
21.10 CFS	1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.03
21.50 CFS	1.03	1.02	1.02	1.02	1.01	1.01	1.00	1.00
21.90 CFS	1.00	.99	.99	.99	.98	.98	.98	.97
22.30 CFS	.97	.97	.96	.96	.96	.96	.95	.95
22.70 CFS	.95	.94	.94	.94	.94	.93	.93	.93
23.10 CFS	.93	.92	.92	.92	.92	.92	.91	.91
23.50 CFS	.91	.91	.90	.90	.90	.90	.90	.89
23.90 CFS	.89	.89	.89	.88	.88	.87	.86	.84
24.30 CFS	.81	.79	.76	.73	.70	.67	.64	.61
24.70 CFS	.58	.56	.53	.51	.49	.47	.45	.43
25.10 CFS	.41	.39	.37	.35	.34	.32	.31	.30
25.50 CFS	.28	.27	.26	.25	.24	.22	.21	.21
25.90 CFS	.20	.19	.18	.17	.16	.16	.15	.14
26.30 CFS	.14	.13	.12	.12	.11	.11	.10	.10

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.80 WATERSHED INCHES; 67 CFS-HRS; 5.6 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	10	5	3	2	2	1	1	1

  

DURATION(HRS)	18	18
FLOW(CFS)	1	0

--- STRUCTURE 1, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET) (RUNOFF)
12.07	87.6	

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 2 JOB NO. 1 PAGE 12

HRS MAIN TIME INCREMENT = .050 hr, DRAINAGE AREA = .02 SQ.MI.  
 6.95 CFS .50 .51 .52 .54 .55 .56 .58 .59  
 7.35 CFS .60 .62 .63 .64 .66 .67 .69 .70

					BVDEV.OUT			
7.75 CFS	.71	.73	.74	.76	.77	.78	.80	.81
8.15 CFS	.83	.85	.87	.90	.93	.95	.99	1.02
8.55 CFS	1.05	1.08	1.12	1.15	1.19	1.23	1.26	1.30
8.95 CFS	1.34	1.38	1.42	1.46	1.49	1.52	1.55	1.58
9.35 CFS	1.60	1.62	1.64	1.66	1.68	1.70	1.73	1.76
9.75 CFS	1.80	1.84	1.89	1.95	2.01	2.07	2.13	2.19
10.15 CFS	2.26	2.34	2.42	2.51	2.59	2.69	2.78	2.88
10.55 CFS	2.98	3.09	3.20	3.33	3.46	3.61	3.76	3.92
10.95 CFS	4.09	4.26	4.44	4.63	4.85	5.10	5.39	5.72
11.35 CFS	6.08	6.46	6.86	7.28	7.93	9.12	11.33	14.90
11.75 CFS	20.20	27.40	37.32	50.22	65.16	78.72	86.77	86.31
12.15 CFS	77.58	64.77	51.86	40.88	32.73	27.13	22.91	19.61
12.55 CFS	17.00	14.89	13.20	11.86	10.81	9.97	9.29	8.74
12.95 CFS	8.29	7.91	7.58	7.29	7.02	6.78	6.56	6.36
13.35 CFS	6.18	6.02	5.85	5.70	5.55	5.40	5.26	5.13
13.75 CFS	5.00	4.88	4.77	4.66	4.55	4.44	4.34	4.24
14.15 CFS	4.14	4.06	3.99	3.93	3.87	3.82	3.78	3.74
14.55 CFS	3.70	3.66	3.62	3.59	3.55	3.51	3.48	3.44
14.95 CFS	3.40	3.37	3.33	3.29	3.26	3.22	3.18	3.15
15.35 CFS	3.11	3.07	3.04	3.00	2.96	2.93	2.89	2.85
15.75 CFS	2.82	2.78	2.74	2.71	2.67	2.63	2.60	2.56
16.15 CFS	2.53	2.50	2.48	2.45	2.43	2.42	2.40	2.39
16.55 CFS	2.37	2.36	2.35	2.33	2.32	2.31	2.29	2.28
16.95 CFS	2.27	2.25	2.24	2.23	2.21	2.20	2.19	2.17
17.35 CFS	2.16	2.15	2.14	2.12	2.11	2.10	2.08	2.07
17.75 CFS	2.06	2.04	2.03	2.02	2.00	1.99	1.98	1.96
18.15 CFS	1.95	1.94	1.93	1.91	1.90	1.89	1.87	1.86
18.55 CFS	1.85	1.83	1.82	1.81	1.79	1.78	1.77	1.75
18.95 CFS	1.74	1.73	1.71	1.70	1.69	1.67	1.66	1.65
19.35 CFS	1.63	1.62	1.61	1.59	1.58	1.57	1.55	1.54
19.75 CFS	1.53	1.52	1.50	1.49	1.48	1.46	1.45	1.44
20.15 CFS	1.42	1.41	1.41	1.40	1.39	1.39	1.39	1.38
20.55 CFS	1.38	1.38	1.37	1.37	1.37	1.37	1.36	1.36
20.95 CFS	1.36	1.36	1.35	1.35	1.35	1.35	1.34	1.34
21.35 CFS	1.34	1.33	1.33	1.33	1.33	1.32	1.32	1.32
21.75 CFS	1.32	1.31	1.31	1.31	1.31	1.30	1.30	1.30
22.15 CFS	1.30	1.29	1.29	1.29	1.29	1.28	1.28	1.28
22.55 CFS	1.27	1.27	1.27	1.27	1.26	1.26	1.26	1.26
22.95 CFS	1.25	1.25	1.25	1.25	1.24	1.24	1.24	1.24
23.35 CFS	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.21
23.75 CFS	1.21	1.21	1.21	1.20	1.20	1.20	1.17	1.08
24.15 CFS	.91	.71	.51	.35				

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.40 WATERSHED INCHES; 83 CFS-HRS; 6.9 ACRE-FEET.

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 2 JOB NO. 1 PAGE 13

DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	6	4	2	2	2	1	1	1

DURATION(HRS)	17
FLOW(CFS)	0

--- XSECTION 2, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION ADDHYD XSECTION 3

## BVDEV.OUT

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.72	17.1	(NULL)
12.08	98.7	(NULL)

HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =99

HRS	MAIN TIME	INCREMENT = .050	hr,	DRAINAGE AREA = .04	SQ.MI.
6.65 CFS	.42	15.47	14.82	14.19	13.59
7.05 CFS	11.46	10.99	10.54	10.11	9.70
7.45 CFS	8.24	7.92	7.61	7.32	7.04
7.85 CFS	6.06	5.84	5.63	5.44	5.25
8.25 CFS	4.61	4.48	4.36	4.24	4.14
8.65 CFS	3.79	3.72	3.66	3.60	3.55
9.05 CFS	3.39	3.36	3.33	3.30	3.28
9.45 CFS	3.17	3.15	3.13	3.11	3.10
9.85 CFS	3.15	3.18	3.21	3.26	3.30
10.25 CFS	3.55	3.63	3.72	3.81	3.91
10.65 CFS	4.36	4.49	4.64	4.81	4.98
11.05 CFS	5.77	6.00	6.26	6.56	6.90
11.45 CFS	8.62	9.12	9.86	11.16	13.53
11.85 CFS	41.26	55.15	71.46	86.75	96.77
12.25 CFS	67.94	57.53	49.67	44.15	39.87
12.65 CFS	29.18	27.50	26.08	24.87	23.81
13.05 CFS	20.61	19.96	19.34	18.76	18.21
13.45 CFS	16.26	15.82	15.39	14.97	14.57
13.85 CFS	13.09	12.75	12.42	12.10	11.79
14.25 CFS	10.67	10.43	10.21	10.00	9.79
14.65 CFS	9.06	8.89	8.72	8.57	8.41
15.05 CFS	7.83	7.70	7.57	7.44	7.31
15.45 CFS	6.83	6.72	6.61	6.50	6.40
15.85 CFS	5.99	5.89	5.80	5.70	5.61
16.25 CFS	5.28	5.21	5.14	5.08	5.02
16.65 CFS	4.80	4.75	4.70	4.65	4.60
17.05 CFS	4.43	4.39	4.35	4.31	4.27
17.45 CFS	4.12	4.08	4.05	4.01	3.98
17.85 CFS	3.85	3.82	3.79	3.76	3.73
18.25 CFS	3.61	3.58	3.55	3.52	3.50
18.65 CFS	3.39	3.36	3.33	3.31	3.28
19.05 CFS	3.18	3.15	3.13	3.10	3.08
19.45 CFS	2.98	2.95	2.93	2.90	2.88

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TR20 ----- SCS -  
 001 PROJECT: JK C FILENAME: DATE: 12-3-15 BY: JC VERSION -  
 12/09/\*\* BVdev.DAT 2.04TEST  
 10:24:09 PASS 2 JOB NO. 1 PAGE 14

19.85 CFS	2.78	2.76	2.74	2.71	2.69	2.67	2.64	2.62
20.25 CFS	2.61	2.59	2.57	2.56	2.55	2.54	2.52	2.51
20.65 CFS	2.50	2.49	2.48	2.47	2.46	2.45	2.45	2.44
21.05 CFS	2.43	2.42	2.41	2.40	2.40	2.39	2.38	2.37
21.45 CFS	2.37	2.36	2.35	2.34	2.34	2.33	2.32	2.32
21.85 CFS	2.31	2.31	2.30	2.29	2.29	2.28	2.28	2.27
22.25 CFS	2.26	2.26	2.25	2.25	2.24	2.24	2.23	2.22
22.65 CFS	2.22	2.21	2.21	2.20	2.20	2.19	2.19	2.18
23.05 CFS	2.18	2.17	2.17	2.16	2.16	2.15	2.15	2.14
23.45 CFS	2.14	2.13	2.13	2.12	2.12	2.11	2.11	2.10
23.85 CFS	2.10	2.09	2.09	2.09	2.05	1.96	1.79	1.57
24.25 CFS	1.35	1.16	1.02	.92				

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.57 WATERSHED INCHES; 150 CFS-HRS; 12.4 ACRE-FEET.

	BVDEV.OUT							
DURATION(HRS)	2	4	6	8	10	12	14	16
FLOW(CFS)	15	9	6	4	4	3	2	2

DURATION(HRS) 18  
 FLOW(CFS) 1 TRUNCATED

--- XSECTION 3, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RESVOR STRUCTURE 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.61	30.8	47.99

HRS	MAIN	HYDROGRAPH POINTS FOR	ALTERNATE = 1,	STORM =99	.04 SQ.MI.
		TIME INCREMENT = .050 hr,	DRAINAGE AREA =		
5.50	CFS	.00 .01 .01	.01 .01	.01 .01	.01 .01
5.90	CFS	.01 .01 .01	.01 .02	.02 .02	.02 .02
6.30	CFS	.02 .02 .02	.03 .03	.03 .03	.03 .03
6.70	CFS	.07 .14 .17	.20 .23	.25 .27	.29 .29
7.10	CFS	.32 .34 .35	.36 .37	.38 .39	.39 .39
7.50	CFS	.40 .41 .42	.42 .43	.44 .44	.45 .45
7.90	CFS	.46 .55 .64	.72 .80	.88 .95	1.02 .95
8.30	CFS	1.08 1.14 1.20	1.25 1.30	1.35 1.40	1.44 1.44
8.70	CFS	1.48 1.52 1.56	1.60 1.63	1.66 1.70	1.73 1.73
9.10	CFS	1.78 1.83 1.88	1.92 1.96	2.00 2.03	2.07 2.07
9.50	CFS	2.10 2.13 2.16	2.19 2.22	2.24 2.27	2.30 2.30
9.90	CFS	2.32 2.35 2.37	2.40 2.43	2.46 2.49	2.52 2.52
10.30	CFS	2.55 2.58 2.62	2.66 2.70	2.74 2.78	2.83 2.83
10.70	CFS	2.87 2.92 2.98	3.04 3.10	3.18 3.27	3.37 3.37
11.10	CFS	3.48 3.59 3.71	3.83 3.97	4.12 4.28	4.45 4.45
11.50	CFS	4.64 4.84 5.08	5.38 5.80	6.41 7.26	8.74 8.74
11.90	CFS	11.19 15.71 20.72	21.77 22.77	26.70 28.87	30.00 30.00
12.30	CFS	30.28 30.49 30.63	30.73 30.79	30.83 30.84	30.84 30.84
12.70	CFS	30.82 30.78 30.73	30.68 30.61	30.54 30.47	30.38 30.38

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TR20	PROJECT:	JKC	DATE:12-3-15	BY:JC	SCS -
001	FILENAME:	BVdev.DAT			VERSION
12/09/**	PASS	2	JOB NO.	1	2.04TEST
10:24:09					PAGE 15

13.10	CFS	30.29	30.20	30.10	30.00	29.90	29.65	29.19	28.72
13.50	CFS	28.25	27.78	27.32	26.86	26.40	25.94	25.13	24.26
13.90	CFS	23.43	22.84	22.70	22.56	22.42	22.27	22.13	21.98
14.30	CFS	21.82	21.65	21.48	21.31	21.14	20.97	20.80	20.51
14.70	CFS	19.54	18.63	17.79	17.00	16.27	15.58	14.95	14.35
15.10	CFS	13.77	13.21	12.69	12.20	11.75	11.37	11.09	10.83
15.50	CFS	10.58	10.34	10.10	9.87	9.65	9.44	9.24	9.04
15.90	CFS	8.84	8.66	8.48	8.30	8.13	7.96	7.84	7.73
16.30	CFS	7.63	7.52	7.42	7.32	7.22	7.13	7.03	6.94
16.70	CFS	6.85	6.76	6.67	6.59	6.50	6.42	6.34	6.26
17.10	CFS	6.18	6.11	6.03	5.96	5.89	5.82	5.75	5.68
17.50	CFS	5.61	5.55	5.48	5.42	5.36	5.30	5.24	5.18
17.90	CFS	5.13	5.07	5.02	4.96	4.91	4.86	4.81	4.76
18.30	CFS	4.71	4.66	4.61	4.57	4.52	4.48	4.43	4.39
18.70	CFS	4.35	4.31	4.26	4.22	4.18	4.14	4.10	4.07
19.10	CFS	4.03	3.99	3.95	3.92	3.88	3.85	3.81	3.78
19.50	CFS	3.74	3.71	3.68	3.64	3.61	3.58	3.55	3.52
19.90	CFS	3.48	3.45	3.42	3.39	3.36	3.33	3.30	3.27
20.30	CFS	3.25	3.22	3.19	3.16	3.14	3.12	3.10	3.08
20.70	CFS	3.06	3.05	3.03	3.01	3.00	2.98	2.96	2.95
21.10	CFS	2.93	2.92	2.90	2.89	2.87	2.86	2.84	2.83

				BVDEV	OUT			
21.50 CFS	2.81	2.80	2.79	2.77	2.76	2.75	2.73	2.72
21.90 CFS	2.71	2.70	2.69	2.67	2.66	2.65	2.64	2.63
22.30 CFS	2.62	2.61	2.59	2.58	2.57	2.56	2.55	2.54
22.70 CFS	2.53	2.52	2.51	2.51	2.50	2.49	2.48	2.47
23.10 CFS	2.46	2.45	2.44	2.43	2.43	2.42	2.41	2.40
23.50 CFS	2.39	2.39	2.38	2.37	2.36	2.35	2.35	2.34
23.90 CFS	2.33	2.33	2.32	2.31	2.30	2.29	2.27	2.25
24.30 CFS	2.22	2.18	2.15					

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.96 WATERSHED INCHES; 134 CFS-HRS; 11.1 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	13	
FLOW(CFS)	22	9	5	4	3	3	2	TRUNCATED

--- STRUCTURE 2, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

OPERATION RUNOFF XSECTION 4

PEAK TIME(HRS)	12.07	PEAK DISCHARGE(CFS)	23.5	PEAK ELEVATION(FEET)	(RUNOFF)
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HYDROGRAPH POINTS FOR ALTERNATE = 1, STORM =99					
HRS	MAIN TIME INCREMENT = .050 hr,	DRAINAGE AREA = .01 SQ.MI.			
10.05 CFS	.50 .51 .53 .55 .57 .59 .62 .64				
10.45 CFS	.66 .69 .72 .74 .77 .80 .84 .88				
10.85 CFS	.91 .96 1.00 1.04 1.09 1.14 1.20 1.26				
11.25 CFS	1.34 1.43 1.52 1.62 1.72 1.84 2.01 2.32				
11.65 CFS	2.90 3.87 5.34 7.33 10.02 13.59 17.73 21.36				

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TR20 ----- SCS -  
 001 PROJECT: JKC DATE:12-3-15 BY:JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST  
 10:24:09 PASS 2 JOB NO. 1 PAGE 16

12.05 CFS	23.35	23.14	20.57	16.97	13.48	10.60	8.49	7.06
12.45 CFS	5.97	5.13	4.46	3.92	3.49	3.15	2.87	2.66
12.85 CFS	2.48	2.35	2.23	2.14	2.05	1.97	1.90	1.84
13.25 CFS	1.78	1.73	1.68	1.64	1.59	1.55	1.51	1.47
13.65 CFS	1.43	1.40	1.36	1.33	1.30	1.27	1.24	1.21
14.05 CFS	1.18	1.16	1.13	1.11	1.09	1.07	1.06	1.05
14.45 CFS	1.03	1.02	1.01	1.00	.99	.98	.97	.96
14.85 CFS	.95	.94	.93	.92	.91	.90	.89	.88
15.25 CFS	.87	.86	.85	.84	.83	.82	.81	.80
15.65 CFS	.79	.78	.77	.76	.75	.74	.73	.72
16.05 CFS	.71	.70	.69	.69	.68	.67	.67	.66
16.45 CFS	.66	.65	.65	.65	.64	.64	.64	.63
16.85 CFS	.63	.63	.62	.62	.61	.61	.61	.60
17.25 CFS	.60	.60	.59	.59	.59	.58	.58	.58
17.65 CFS	.57	.57	.56	.56	.56	.55	.55	.55
18.05 CFS	.54	.54	.54	.53	.53	.53	.52	.52
18.45 CFS	.51	.51	.51	.50	.50			

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 5.06 WATERSHED INCHES; 22 CFS-HRS; 1.8 ACRE-FEET.

DURATION(HRS)	2	4	6	8	9
FLOW(CFS)	2	1	1	1	0

--- XSECTION 4, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

## BVDEV.OUT

OPERATION ADDHYD XSECTION 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.15	47.3	(NULL)

HRS	MAIN	HYDROGRAPH POINTS FOR		ALTERNATE = 1,	DRAINAGE AREA =	STORM =99	.05 SQ.MI.		
		TIME	INCREMENT = .050 hr,						
7.35	CFS	.49	.50	.51	.52	.54	.55	.56	.57
7.75	CFS	.58	.59	.60	.61	.70	.79	.88	.97
8.15	CFS	1.05	1.12	1.20	1.27	1.33	1.40	1.46	1.52
8.55	CFS	1.57	1.63	1.68	1.73	1.78	1.82	1.87	1.91
8.95	CFS	1.96	2.00	2.05	2.11	2.16	2.21	2.27	2.31
9.35	CFS	2.36	2.40	2.44	2.48	2.51	2.55	2.58	2.62
9.75	CFS	2.66	2.69	2.73	2.77	2.81	2.86	2.90	2.94
10.15	CFS	2.99	3.04	3.09	3.14	3.20	3.26	3.32	3.39
10.55	CFS	3.45	3.52	3.60	3.68	3.76	3.85	3.95	4.05
10.95	CFS	4.17	4.31	4.46	4.62	4.79	4.97	5.17	5.40
11.35	CFS	5.64	5.90	6.17	6.47	6.85	7.40	8.28	9.68
11.75	CFS	11.74	14.59	18.75	24.79	33.44	42.08	45.12	45.91
12.15	CFS	47.26	45.83	43.48	40.88	38.98	37.69	36.70	35.92
12.55	CFS	35.29	34.76	34.33	33.96	33.65	33.39	33.16	32.96
12.95	CFS	32.78	32.60	32.43	32.27	32.11	31.94	31.78	31.63
13.35	CFS	31.33	30.82	30.31	29.80	29.29	28.79	28.29	27.79
13.75	CFS	27.30	26.46	25.56	24.70	24.08	23.91	23.74	23.57

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TR20 ----- SCS -				
001	PROJECT: JKC	DATE: 12-3-15	BY: JC	VERSION
12/09/**	FILENAME: BVdev.DAT			2.04TEST
10:24:09	PASS 2	JOB NO. 1		PAGE 17

14.15	CFS	23.40	23.23	23.07	22.89	22.71	22.53	22.34	22.16
14.55	CFS	21.98	21.80	21.50	20.52	19.60	18.75	17.95	17.21
14.95	CFS	16.52	15.87	15.26	14.67	14.10	13.57	13.07	12.61
15.35	CFS	12.22	11.94	11.66	11.40	11.15	10.90	10.67	10.44
15.75	CFS	10.21	10.00	9.79	9.59	9.39	9.20	9.01	8.83
16.15	CFS	8.66	8.52	8.41	8.30	8.19	8.09	7.98	7.88
16.55	CFS	7.78	7.68	7.58	7.49	7.40	7.31	7.22	7.13
16.95	CFS	7.04	6.96	6.88	6.79	6.71	6.64	6.56	6.48
17.35	CFS	6.41	6.34	6.27	6.20	6.13	6.06	5.99	5.93
17.75	CFS	5.87	5.80	5.74	5.68	5.62	5.56	5.51	5.45
18.15	CFS	5.40	5.34	5.29	5.24	5.18	5.13	5.08	5.03
18.55	CFS	4.99	4.94	4.89	4.84	4.80	4.75	4.71	4.67
18.95	CFS	4.62	4.58	4.54	4.50	4.45	4.41	4.37	4.34
19.35	CFS	4.30	4.26	4.22	4.18	4.14	4.11	4.07	4.03
19.75	CFS	4.00	3.96	3.93	3.89	3.86	3.82	3.79	3.76
20.15	CFS	3.72	3.69	3.66	3.63	3.60	3.57	3.55	3.52
20.55	CFS	3.50	3.48	3.46	3.44	3.42	3.41	3.39	3.37
20.95	CFS	3.35	3.34	3.32	3.30	3.29	3.27	3.26	3.24
21.35	CFS	3.22	3.21	3.19	3.18	3.17	3.15	3.14	3.12
21.75	CFS	3.11	3.10	3.08	3.07	3.06	3.04	3.03	3.02
22.15	CFS	3.01	2.99	2.98	2.97	2.96	2.95	2.94	2.93
22.55	CFS	2.91	2.90	2.89	2.88	2.87	2.86	2.85	2.84
22.95	CFS	2.83	2.82	2.81	2.80	2.79	2.78	2.78	2.77
23.35	CFS	2.76	2.75	2.74	2.73	2.72	2.71	2.71	2.70
23.75	CFS	2.69	2.68	2.67	2.66	2.66	2.65	2.63	2.60
24.15	CFS	2.54	2.46	2.38	2.31	2.24	2.19		

RUNOFF ABOVE BASEFLOW (BASEFLOW = .00 CFS)  
 4.97 WATERSHED INCHES; 156 CFS-HRS; 12.9 ACRE-FEET.

DURATION(HRS)	2	4	6	8	10	12	14	15
---------------	---	---	---	---	----	----	----	----

FLOW(CFS) 25 10 6 4 3 3 3 2 TRUNCATED  
 --- XSECTION 5, ALTERNATE 1, STORM 99, HYDROGRAPH ADDED TO READHD FILE ---

EXECUTIVE CONTROL ENDCMP COMPUTATIONS COMPLETED FOR PASS 2  
 ♀

TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT  
 10:24:09 SUMMARY, JOB NO. 1 PAGE 18

#### SUMMARY TABLE 1

SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL IN ORDER PERFORMED.  
 A CHARACTER FOLLOWING THE PEAK DISCHARGE TIME AND RATE (CFS) INDICATES:  
 F-FLAT TOP HYDROGRAPH T-TRUNCATED HYDROGRAPH R-RISING TRUNCATED HYDROGRAPH

XSECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RUNOFF AMOUNT (IN)	ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	RATE (CFS)	RATE (CSM)
------------------------------	----------------------------------	-----------------------------	--------------------------	-------------------	--------------------------------	---------------	---------------

RAINFALL OF 5.20 inches AND 24.00 hr DURATION, BEGINS AT .0 hrs.  
 RAINTABLE NUMBER 2, ARC 2  
 MAIN TIME INCREMENT .050 HOURS

ALTERNATE 1 STORM 10

XSECTION 1	RUNOFF	.02	2.52	---	12.08	32	1600.0
STRUCTURE 1	RESVOR	.02	3.94	51.50	8.60	15	750.0
XSECTION 2	RUNOFF	.02	3.35	---	12.08	55	2750.0
XSECTION 3	ADDHYD	.04	3.61	---	12.09	62	1550.0
STRUCTURE 2	RESVOR	.04	3.11	45.14	12.51	22	550.0
XSECTION 4	RUNOFF	.01	3.07	---	12.07	14	1400.0
XSECTION 5	ADDHYD	.05	3.11	---	12.15	33	660.0

RAINFALL OF 7.40 inches AND 24.00 hr DURATION, BEGINS AT .0 hrs.

ALTERNATE 1 STORM 99

XSECTION 1	RUNOFF	.02	4.39	---	12.07	55	2750.0
STRUCTURE 1	RESVOR	.02	5.80	51.57	12.41	17	850.0
XSECTION 2	RUNOFF	.02	5.40	---	12.07	88	4400.0
XSECTION 3	ADDHYD	.04	5.57	---	12.08	99	2475.0
STRUCTURE 2	RESVOR	.04	4.96	47.99	12.61	31	775.0
XSECTION 4	RUNOFF	.01	5.06	---	12.07	24	2400.0
XSECTION 5	ADDHYD	.05	4.97	---	12.15	47	940.0

♀  
 TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT  
 10:24:09 SUMMARY, JOB NO. 1 PAGE 19

#### SUMMARY TABLE 3

STORM DISCHARGES (CFS) AT XSECTIONS AND STRUCTURES FOR ALL ALTERNATES  
 Page 17

BVDEV.OUT  
QUESTION MARK (?) AFTER: OUTFLOW PEAK - RISING TRUNCATED HYDROGRAPH.

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS.....
		10 99
STRUCTURE 2	.04	
ALTERNATE 1		22 31
STRUCTURE 1	.02	
ALTERNATE 1		15 17
XSECTION 1	.02	
ALTERNATE 1		32 55
XSECTION 2	.02	
ALTERNATE 1		55 88
XSECTION 3	.04	
ALTERNATE 1		62 99
XSECTION 4	.01	
ALTERNATE 1		14 24
XSECTION 5	.05	
ALTERNATE 1		33 47

♀  
 TR20 ----- SCS -  
 001 PROJECT: JKC DATE: 12-3-15 BY: JC VERSION  
 12/09/\*\* FILENAME: BVdev.DAT 2.04TEST

END OF 1 JOBS IN THIS RUN

\*\*\* WARNING - UNEXPECTED RECORD(S) ENCOUNTERED WHEN LOOKING FOR "JOB" RECORD.  
 IMAGES OF FIRST 10 RECORDS IGNORED FOLLOW: \*\*\*

SCS TR-20, VERSION 2.04TEST  
 001 FILES

INPUT = C:\ENGR\TR20\TR20V204\BVDEV.TXT , GIVEN DATA FILE  
 OUTPUT = C:\ENGR\TR20\TR20V204\BVDEV.OUT , DATED 12/09/\*\*, 10:24:09  
 Page 18

BVDEV.OUT

FILES GENERATED - DATED 12/09/\*\*,10:24:09

FILE C:\ENGR\TR20\TR20V204\BVDEV.TRD CONTAINS READHD INFORMATION

TOTAL NUMBER OF WARNINGS = 1, MESSAGES = 4

JOB ENDED AT 10:24:09  
\*\*\* TR-20 RUN COMPLETED \*\*\*

# **Appendix D**

# **Pond Computations**

# Bay Engineering, Inc.

## Bay Village

### Original Forebay Sizing Computations Revised to Show Forebay Volume Required is Provided in modified Pond

Offsite Impervious Area to Pond = 3.47 acres (based on original approved comps)  
Onsite Impervious Area \* = 0.75 acres (excluding Lot 4)

Forebay Volume Required = 0.04 acre-feet  
1532 cubic feet

---

Stage	Delta H	Area	Ave. Area	Gross Storage	Net Storage, Ac. Ft.	POND	POND AND PIPE	Cumulative Storage (ac-ft)
						Cumulative Storage (ac-ft)	Net Storage in Pipes (ac-ft)	
37.00	0.00	1452	0	0	0.00000	0.00000	0.00000	0.00000 0.00
37.20	0.20	1567	1510	302	0.00693	0.00693	0.03654	0.04347 1893.60
37.40	0.20	1683	1625	325	0.00746	0.01439	0.04338	0.09431 4108.26
37.60	0.20	1798	1741	348	0.00799	0.02238	0.04680	0.14910 6494.97
37.80	0.20	1914	1856	371	0.00852	0.03091	0.05022	0.20785 9053.75
38.00	0.20	2029	1971	394	0.00905	0.03996	0.05240	0.26929 11730.42

Storage provided at weir elevation of 37.60 = 6494.97 cf

\* This area represents the area on Lots 1, 3 , and the ROW that do not drain to BMP's located on the lots. It is assumed that Lot 2 and 4 will provide WQV on their respective lots; thus, storage in the forebay for these lots is not included.

# Bay Engineering, Inc.

## Bay Village Stage Storage for Water Quality Volume

Water Quality Volume Required in Pond (including Forebay)\* = 5659.00 cf

\*per Originally Approved Computations (excluding Lot 4)

Lost Volume in Existing Biorentention Area #4B = 53 cf

Total WQV Required = 5712 cf

Stage	Delta H	Area	Ave. Area	Gross Storage	Net Storage, Ac. Ft.	POND		POND AND PIPE	
						Cumulative Storage (ac-ft)	Net Storage in Pipes (ac-ft)	ve Storage (ac-ft)	ve Storage (ac-ft)
37.00	0.00	2917	0	0	0.00000	<b>0.00000</b>	0.00000	0.00000	0.00
37.20	0.20	3208	3062	612	0.01406	<b>0.01406</b>	0.03654	0.05060	2204.14
37.40	0.20	3499	3353	671	0.01540	<b>0.02946</b>	0.04338	0.10938	4764.42
37.60	0.20	3789	3644	729	0.01673	<b>0.04619</b>	0.04680	0.17291	7531.83
37.80	0.20	4080	3935	787	0.01807	<b>0.06425</b>	0.05022	0.24119	10506.39
38.00	0.20	4371	4226	845	0.01940	<b>0.08365</b>	0.05240	0.31299	13633.92

Storage provided at weir elevation of 37.60 =

7531.83 cf

Extra WQV provided at elevation 37.60 =

1819.83 cf (to be applied to Lot 4 CpV requirement - refer to CpV comps)

## CHANNEL PROTECTION VOLUME COMPUTATIONS

**Development** Bay Village  
**Location** City of Annapolis  
**Job No.** 04-1096

**Date** 12/01/15  
**Computed by** JC

### Calculate channel protection requirements.

Please note these computations are based on the original approved CpV computations. First the original CpV computations have been modified to exclude Lot 4 (which was previously included depicting Lot 4 in existing conditions) to calculate a new revised CpV. Then the CpV required for Lot 4 only (as a result of the ESD volume provided on Lot 4) has been added to compute a revised total CpV to be provided in the pond.

Per attached TR 55 calculations:

#### **Modified Drainage Area to the Pond (excluding Lot 4)**

	Area (acres)	CN	Tc (hours)	Runoff Qa 1-year storm (inches)	Q 1-year (cfs)
DA #1	20.60	81	0.31	0.72	22.07

$$\begin{aligned} Ia &= 200/CN - 2 = & 0.469 \\ P \text{ (1-year)} &= & 2.7 \\ Ia/P &= & 0.17 \end{aligned}$$

$$\begin{aligned} \text{unit peak factor } q_u \text{ (from Figure D.11.1)} &= & 620 \text{ csm/in} \\ 1\text{-yr. post development peak discharge } q_i &= q_u A Q_a = & 14.37 \text{ cfs} \end{aligned}$$

$$\begin{aligned} q_o/q_i \text{ for T = 24 (from Figure D.11.2)} &= & 0.030 \\ \text{peak outflow } q_o &= q_o/q_i * q_i = & 0.43 \text{ cfs} \end{aligned}$$

$$\begin{aligned} V_s/V_r &= 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 0.804(q_o/q_i)^3 = & 0.64 \\ \text{ext. detention storage volume } V_s &= V_s/V_r * V_r = V_s/V_r * Q_a = & 0.46 \text{ in} \\ &= & 0.79 \text{ ac-ft} \end{aligned}$$

CpV required for drainage area excluding Lot 4 =	34541.4 cf	Lot 4
Additional CpV Volume Required Based on ESD comps =	10498.0 cf	
Total CpV Required in Pond =	45039.4 cf	Total
Extra WQV provided in Pond =	1819.8 cf	
Net CpV Volume to be Provided in Pond =	43219.6 cf	

$$\begin{aligned} \text{Associated storage elevation in pond} &= & 40.00 \text{ ft} \\ \text{Bottom storage elevation} &= & 37.60 \text{ ft} \\ \text{Storage depth } h_o \text{ associated with } V_s &= & 2.40 \text{ ft} \end{aligned}$$

$$\text{Required orifice area } A_o = q_o/4.81/(h_o)^{1/2} = & 0.06 \text{ sf}$$

$$\begin{aligned} \text{Maximum orifice diameter } d_o &= (4A_o/\pi)^{1/2} = & 0.27 \text{ ft} \\ &= & 3.26 \text{ in} \end{aligned}$$

Note: The existing low flow orifice in the pond is a 3.4" internal orifice at elevation 37.60. Given this, calculate actual discharge rate and extended detention time to make sure 24 hour extended detention is provided.

Use the orifice equation.

C =	0.6
3.4" low flow =	37.74 ft
Actual storage elevation of 1-year storm =	40.00 ft
h = storage elevation - centroid elevation =	2.26 ft
diameter =	3.4 inches
A =	0.063 sf
Q = C*A*(2*g*h) <sup>1/2</sup> ] =	0.456 cfs

Storage volume at Cpv water surface elevation (refer to Stage Discharge Computations for pond) =	43426.0 cf
Release rate = storage volume/Q =	95151.6 seconds
=	26.43 hours
	OK

**STAGE STORAGE COMPUTATIONS  
FOR STORAGE PIPE UNDER GARAGE**

<b>Development Location</b>	Bay Village	<b>Date</b>	12/01/15
<b>Job No.</b>	Anne Arundel County	<b>Computed by</b>	JC

Total Area of Trench#1 =

15494 sf

Diameter of Pipe =

5 ft

Radius of Pipe =

2.5 ft

X Sectional Area of Pipe =

19.63 ft

Length of Pipe =

1984 ft (inside trench)

Length of Pipe =

184 ft(outside trench)

Void Ratio =

0.4

Invert of Pipe =

37.00 ft

Invert of Stone =

36.50 ft

WSE Trench	Delta H	Volume of Trench (without pipes)	Volume of Pipes (cf) (inside trench)	Volume of Pipes (cf) (outside trench)	Remaining Volume in Trench	Volume of Stone (Rem. Volume x Void Ratio)	Volume of Stone (Rem. Volume x Void Ratio)	Total Volume in stone and pipes	Gross Storage (cf)	Net Storage, Ac. Ft.	Cumulative Storage Ac. Ft.	Partial Cross-Sectional Area
37.00	0.00	3098.80	510.84	42.64	0.0	0.0	0.0	0	0.00000	0.00000	0	37.00
37.20	0.20	3098.80	510.84	42.64	0.0	0.0	0.0	0	0.00000	0.00000	0.00000	0.26
37.40	0.20	3098.80	952.32	78.72	2146.5	858.6	1591.7	1592	0.03654	1591.664	37.20	0.20
37.60	0.20	3098.80	1170.56	96.76	1928.2	771.3	2038.6	1890	0.04338	3481.296	37.40	0.40
37.80	0.20	3098.80	1388.80	114.80	1710.0	684.0	2187.6	2039	0.04680	5519.912	37.60	0.60
38.00	0.20	3098.80	1527.68	126.28	1571.1	628.4	2282.4	2188	0.05022	7707.512	37.80	0.80
38.20	0.20	3098.80	1626.88	134.48	1471.9	568.8	2350.1	2282	0.05240	9989.92	38.00	1.00
38.40	0.20	3098.80	1745.92	144.32	1352.9	541.2	2431.4	2350	0.05395	12340.048	38.20	1.20
38.60	0.20	3098.80	1825.28	150.88	1273.5	509.4	2485.6	2431	0.05582	14771.44	38.40	1.40
38.80	0.20	3098.80	1864.96	154.16	1233.8	493.5	2512.7	2486	0.05706	17257.008	38.60	1.60
39.00	0.20	3098.80	1924.48	159.08	1174.3	469.7	2553.3	2513	0.05768	19769.664	38.80	1.80
39.20	0.20	3098.80	1964.16	162.36	1134.6	453.9	2580.4	2553	0.05862	22322.952	39.00	2.00
39.40	0.20	3098.80	1984.00	164.00	1114.8	445.9	2593.9	2594	0.05955	24903.328	39.20	2.20
39.60	0.20	3098.80	1984.00	164.00	1114.8	445.9	2593.9	2594	0.05955	27497.248	39.40	2.40
39.80	0.20	3098.80	1964.16	162.36	1134.6	453.9	2580.4	2580	0.05924	30091.168	39.60	2.60
40.00	0.20	3098.80	1964.16	162.36	1134.6	453.9	2580.4	2580	0.05924	32671.544	39.80	2.80
40.20	0.20	3098.80	1924.48	159.08	1174.3	469.7	2553.3	2553	0.05862	35251.192	40.00	3.00
40.40	0.20	3098.80	1884.80	155.80	1214.0	485.6	2526.2	2526	0.05799	38705.208	40.20	3.20
40.60	0.20	3098.80	1805.44	149.24	1293.4	517.3	2472.0	2472	0.05675	40331.408	40.40	3.40
40.80	0.20	3098.80	1745.92	144.32	144.32	541.2	2431.4	2431	0.05882	42803.432	40.60	3.60
41.00	0.20	3098.80	1646.72	136.12	145.21	580.8	2363.7	2364	0.05426	45234.824	40.80	3.80
41.20	0.20	3098.80	1527.68	126.28	1571.1	628.4	2282.4	2282	0.05240	47598.496	41.00	4.00
41.40	0.20	3098.80	1368.96	113.16	1729.8	691.9	2174.1	2174	0.04991	512054.96	41.20	4.20
41.60	0.20	3098.80	1190.40	98.40	1908.4	763.4	2052.2	2052	0.04711	54107.112	41.40	4.40
41.80	0.20	3098.80	932.48	77.08	2166.3	866.5	1876.1	1876	0.04307	55983.208	41.60	4.60
42.00	0.20	3098.80	515.84	42.64	2583.0	1033.2	1591.7	1592	0.03654	57574.872	41.80	4.80
42.20	0.20	3098.80	0.00	0.00	3098.8	1239.5	1239.5	1240	0.02846	58814.392	42.00	5.00
42.40	0.20	3098.80	0.00	0.00	3098.8	1239.5	1239.5	1240	0.02846	60053.912	42.40	5.00
42.50	0.10	1549.40	0.00	0.00	1549.40	619.8	619.8	620	0.01423	1.33288	60673.672	42.50
<b>Total Storage Volume Provided in Trench</b>												<b>1.33288</b>
<b>Total Storage Volume Provided in Trench</b>												60673.67
<b>ac. ft.</b>												<b>cu. ft.</b>

# Bay Engineering, Inc.

## Bay Village

### Stage Storage (Above WQV)

Stage	Delta H	Area	Ave. Area	Gross Storage	Net Storage, Ac. Ft.	Cumulative Storage (ac-ft)	Pond Cumulative Storage (cf)	Pond and Pipe Trench		
								Pipe/Trench Net Storage (ac-ft)	Pipe/Trench Cumulative ft	Pond Cumulative Storage (ac-ft) & Pond Storage (cf)
37.60	0.00	3789	0	0	0.00000	0.00000	0.00	0.00000	0	0.00
37.80	0.20	4080	3935	787	0.01807	0.07897	3440.08	0.0502	0.06829	2974.56
38.00	0.20	4371	4226	845	0.01940	0.09837	4285.20	0.0524	0.14008	6102.09
38.20	0.20	4704	4538	908	0.02083	0.11921	5192.74	0.0540	0.21487	9359.76
38.40	0.20	5038	4871	974	0.02237	0.14157	6166.96	0.0558	0.29305	12765.37
38.60	0.20	5371	5205	1041	0.02390	0.16547	7207.86	0.0571	0.37401	16291.84
38.80	0.20	5705	5538	1108	0.02543	0.19090	8315.44	0.0577	0.45712	19912.07
39.00	0.20	6038	5871	1174	0.02696	0.21785	9489.70	0.0586	0.54269	23639.62
39.20	0.20	6366	6202	1240	0.02848	0.24633	10730.09	0.0592	0.63040	27460.38
39.40	0.20	6694	6530	1306	0.02998	0.27631	12036.03	0.0595	0.71993	31360.24
39.60	0.20	7021	6858	1372	0.03149	0.30779	13407.53	0.0595	0.81097	35325.66
39.80	0.20	7349	7185	1437	0.03299	0.34078	14844.59	0.0592	0.90319	39343.09
40.00	0.20	7677	7513	1503	0.03450	0.37528	16347.21	0.0592	0.99693	43426.09
40.20	0.20	7993	7835	1567	0.03597	0.41125	17914.17	0.0586	1.09151	47546.34
40.40	0.20	8308	8150	1630	0.03742	0.44867	19544.25	0.0580	1.18693	51702.62
40.60	0.20	8624	8466	1693	0.03887	0.48754	21237.45	0.0567	1.28255	55867.84
40.80	0.20	8939	8782	1756	0.04032	0.52786	22993.77	0.0558	1.37869	60055.55
41.00	0.20	9255	9097	1819	0.04177	0.56963	24813.21	0.0543	1.47472	64238.66
41.20	0.20	9577	9416	1883	0.04323	0.61287	26696.41	0.0524	1.57035	68404.27
41.40	0.20	9899	9738	1948	0.04471	0.65758	28644.01	0.0499	1.66497	72525.93
41.60	0.20	10221	10060	2012	0.04619	0.70377	30656.01	0.0471	1.75827	76590.09
41.80	0.20	10543	10382	2076	0.04767	0.75143	32732.41	0.0431	1.84900	80542.58
42.00	0.20	10865	10704	2141	0.04915	0.80058	34873.21	0.0365	1.93469	84275.04
42.20	0.20	11215	11040	2208	0.05069	0.85127	37081.23	0.0285	2.01383	87722.58
42.40	0.20	11565	11390	2278	0.05230	0.90356	39359.29	0.0285	2.09459	91240.16
42.60	0.20	11916	11741	2348	0.05390	0.95747	41707.39	0.0142	2.16272	94208.02
42.80	0.20	12266	12091	2418	0.05551	1.01298	44125.53	0.0000	2.21823	96626.16
43.00	0.20	12616	12441	2488	0.05712	1.07010	46613.71	0.0000	2.27535	99114.34
43.20	0.20	12958	12787	2557	0.05871	1.12881	49171.10	0.0000	2.33406	101671.74
43.40	0.20	13300	13129	2626	0.06028	1.18909	51796.91	0.0000	2.39434	104297.54
43.60	0.20	13642	13471	2694	0.06185	1.25094	54491.10	0.0000	2.45619	106991.74
43.80	0.20	13984	13813	2763	0.06342	1.31436	57253.71	0.0000	2.51961	109754.34
44.00	0.20	14326	14155	2831	0.06499	1.37936	60084.71	0.0000	2.58460	112585.34
44.20	0.20	14668	14497	2899	0.06656	1.44592	62984.10	0.0000	2.65116	115484.74
44.40	0.20	15010	14839	2968	0.06813	1.51405	65951.91	0.0000	2.71930	118452.54
44.60	0.20	15352	15181	3036	0.06970	1.58375	68988.11	0.0000	2.78900	121488.74
44.80	0.20	15694	15523	3105	0.07127	1.65502	72092.71	0.0000	2.86027	124593.34
45.00	0.20	16129	15912	3182	0.07306	1.72808	75275.01	0.0000	2.93333	127775.64
45.20	0.20	16499	16314	3263	0.07490	1.80298	78537.81	0.0000	3.00823	131038.44
45.40	0.20	16869	16684	3337	0.07660	1.87958	81874.61	0.0000	3.08483	134375.24
45.60	0.20	17239	17054	3411	0.07830	2.03618	88696.21	0.0000	3.24143	141196.84
45.80	0.20	17609	17424	3485	0.08000	2.11618	92181.01	0.0000	3.32143	144681.64
46.00	0.20	17979	17794	3559	0.08170	2.19788	95739.81	0.0000	3.40313	148240.44
46.20	0.20	18356	18168	3634	0.08341	2.28130	99373.31	0.0000	3.48655	151873.94
46.40	0.20	18733	18545	3709	0.08514	2.36644	103082.21	0.0000	3.57169	155582.84
46.60	0.20	19110	18922	3784	0.08688	2.45332	106866.51	0.0000	3.65857	159367.14
46.80	0.20	19487	19299	3860	0.08861	2.54192	110726.21	0.0000	3.74717	163226.84
47.00	0.20	19864	19676	3935	0.09034	2.63226	114661.31	0.0000	3.83751	167161.94
47.20	0.20	20270	20067	4013	0.09214	2.72440	118674.73	0.0000	3.92965	171175.36
47.40	0.20	20676	20473	4095	0.09400	2.81840	122769.39	0.0000	4.02365	175270.02
47.60	0.20	21083	20880	4176	0.09587	2.91426	126945.29	0.0000	4.11951	179445.92
47.80	0.20	21489	21286	4257	0.09773	3.01199	131202.43	0.0000	4.21724	183703.06
48.00	0.20	21895	21692	4338	0.09960	3.11159	135540.81	0.0000	4.31684	188041.44
48.20	0.20	21502	21698	4340	0.09962	3.21121	139880.47	0.0000	4.41646	192381.10
48.40	0.20	21108	21305	4261	0.09782	3.30903	144141.45	0.0000	4.51428	196642.08
48.60	0.20	20715	20912	4182	0.09601	3.40504	148323.75	0.0000	4.61029	200824.38
48.80	0.20	20321	20518	4104	0.09421	3.49925	152427.37	0.0000	4.70450	204928.00
49.00	0.20	23862	22092	4418	0.10143	3.60068	156845.71	0.0000	4.80593	209346.34

**STAGE DISCHARGE COMPUTATIONS  
FOR QUANTITY MANAGEMENT PROVIDED IN SWM POND  
FOR TR-20 ANALYSIS AT POND**

Development	Bay Village	Date	12/01/15
Location	City of Annapolis	Computed by	JC
Job No.	04-1096		
<b>Low Flow Orifice, 3.4" Diameter Opening</b>			
Weir Length (inches)	5.34	Weir #1 (10' notch in front/weir)	
Orifice Height (inches)	3.40	WSE in Pond	Head (ft)
Invert Elevation	37.50	Condition	Q (cfs)
Orifice Coeff.	0.6	WSE in Pond	Head (ft)
Weir Coeff.	3.1	Condition	Q (cfs)
Orifice Diameter (inches)	3.40	WSE in Pond	Head (ft)
		Total Capacity From Openings	Q (cfs)
37.80 0.000	0.000	0.000	0.000
37.80 0.200	0.000	0.000	0.000
38.00 0.258	0.000	0.000	0.000
38.00 0.154	0.000	0.000	0.000
38.20 0.206	0.000	0.000	0.000
38.40 0.246	0.000	0.000	0.000
38.60 0.281	0.000	0.000	0.000
38.80 0.312	0.000	0.000	0.000
39.00 0.341	0.000	0.000	0.000
39.20 0.367	0.000	0.000	0.000
39.40 0.391	0.000	0.000	0.000
39.60 0.414	0.000	0.000	0.000
39.80 0.436	0.000	0.000	0.000
40.00 0.456	0.000	0.000	0.000
40.20 0.476	0.000	0.000	0.000
40.40 0.495	0.000	0.000	0.000
40.60 0.513	0.000	0.000	0.000
40.80 0.531	0.000	0.000	0.000
41.00 0.548	0.000	0.000	0.000
41.20 0.565	0.000	0.000	0.000
41.40 0.582	0.000	0.000	0.000
41.60 0.593	0.000	0.000	0.000
41.80 0.606	0.000	0.000	0.000
42.00 0.623	0.000	0.000	0.000
42.20 0.639	0.000	0.000	0.000
42.40 0.656	0.000	0.000	0.000
42.60 0.672	0.000	0.000	0.000
42.80 0.688	0.000	0.000	0.000
43.00 0.704	0.000	0.000	0.000
43.20 0.720	0.000	0.000	0.000
43.40 0.736	0.000	0.000	0.000
43.60 0.752	0.000	0.000	0.000
43.80 0.768	0.000	0.000	0.000
44.00 0.784	0.000	0.000	0.000
44.20 0.800	0.000	0.000	0.000
44.40 0.816	0.000	0.000	0.000
44.60 0.832	0.000	0.000	0.000
44.80 0.848	0.000	0.000	0.000
45.00 0.864	0.000	0.000	0.000
45.20 0.880	0.000	0.000	0.000
45.40 0.896	0.000	0.000	0.000
45.60 0.912	0.000	0.000	0.000
45.80 0.928	0.000	0.000	0.000
46.00 0.944	0.000	0.000	0.000
46.20 0.960	0.000	0.000	0.000
46.40 0.976	0.000	0.000	0.000
46.60 0.992	0.000	0.000	0.000
46.80 0.108	0.000	0.000	0.000
47.00 0.124	0.000	0.000	0.000
47.20 0.140	0.000	0.000	0.000
47.40 0.156	0.000	0.000	0.000
47.60 0.172	0.000	0.000	0.000
47.80 0.188	0.000	0.000	0.000
48.00 0.204	0.000	0.000	0.000
48.20 0.220	0.000	0.000	0.000
48.40 0.236	0.000	0.000	0.000
48.60 0.252	0.000	0.000	0.000
48.80 0.268	0.000	0.000	0.000
49.00 0.284	0.000	0.000	0.000
49.20 0.300	0.000	0.000	0.000
49.40 0.316	0.000	0.000	0.000
49.60 0.332	0.000	0.000	0.000
49.80 0.348	0.000	0.000	0.000
50.00 0.364	0.000	0.000	0.000
50.20 0.380	0.000	0.000	0.000
50.40 0.396	0.000	0.000	0.000
50.60 0.412	0.000	0.000	0.000
50.80 0.428	0.000	0.000	0.000
51.00 0.444	0.000	0.000	0.000
51.20 0.460	0.000	0.000	0.000
51.40 0.476	0.000	0.000	0.000
51.60 0.492	0.000	0.000	0.000
51.80 0.508	0.000	0.000	0.000
52.00 0.524	0.000	0.000	0.000
52.20 0.540	0.000	0.000	0.000
52.40 0.556	0.000	0.000	0.000
52.60 0.572	0.000	0.000	0.000
52.80 0.588	0.000	0.000	0.000
53.00 0.604	0.000	0.000	0.000
53.20 0.620	0.000	0.000	0.000
53.40 0.636	0.000	0.000	0.000
53.60 0.652	0.000	0.000	0.000
53.80 0.668	0.000	0.000	0.000
54.00 0.684	0.000	0.000	0.000
54.20 0.700	0.000	0.000	0.000
54.40 0.716	0.000	0.000	0.000
54.60 0.732	0.000	0.000	0.000
54.80 0.748	0.000	0.000	0.000
55.00 0.764	0.000	0.000	0.000
55.20 0.780	0.000	0.000	0.000
55.40 0.796	0.000	0.000	0.000
55.60 0.812	0.000	0.000	0.000
55.80 0.828	0.000	0.000	0.000
56.00 0.844	0.000	0.000	0.000
56.20 0.860	0.000	0.000	0.000
56.40 0.876	0.000	0.000	0.000
56.60 0.892	0.000	0.000	0.000
56.80 0.908	0.000	0.000	0.000
57.00 0.924	0.000	0.000	0.000
57.20 0.940	0.000	0.000	0.000
57.40 0.956	0.000	0.000	0.000
57.60 0.972	0.000	0.000	0.000
57.80 0.988	0.000	0.000	0.000
58.00 0.104	0.000	0.000	0.000
58.20 0.120	0.000	0.000	0.000
58.40 0.136	0.000	0.000	0.000
58.60 0.152	0.000	0.000	0.000
58.80 0.168	0.000	0.000	0.000
59.00 0.184	0.000	0.000	0.000
59.20 0.200	0.000	0.000	0.000
59.40 0.216	0.000	0.000	0.000
59.60 0.232	0.000	0.000	0.000
59.80 0.248	0.000	0.000	0.000
60.00 0.264	0.000	0.000	0.000
60.20 0.280	0.000	0.000	0.000
60.40 0.296	0.000	0.000	0.000
60.60 0.312	0.000	0.000	0.000
60.80 0.328	0.000	0.000	0.000
61.00 0.344	0.000	0.000	0.000
61.20 0.360	0.000	0.000	0.000
61.40 0.376	0.000	0.000	0.000
61.60 0.392	0.000	0.000	0.000
61.80 0.408	0.000	0.000	0.000
62.00 0.424	0.000	0.000	0.000
62.20 0.440	0.000	0.000	0.000
62.40 0.456	0.000	0.000	0.000
62.60 0.472	0.000	0.000	0.000
62.80 0.488	0.000	0.000	0.000
63.00 0.504	0.000	0.000	0.000
63.20 0.520	0.000	0.000	0.000
63.40 0.536	0.000	0.000	0.000
63.60 0.552	0.000	0.000	0.000
63.80 0.568	0.000	0.000	0.000
64.00 0.584	0.000	0.000	0.000
64.20 0.600	0.000	0.000	0.000
64.40 0.616	0.000	0.000	0.000
64.60 0.632	0.000	0.000	0.000
64.80 0.648	0.000	0.000	0.000
65.00 0.664	0.000	0.000	0.000
65.20 0.680	0.000	0.000	0.000
65.40 0.696	0.000	0.000	0.000
65.60 0.712	0.000	0.000	0.000
65.80 0.728	0.000	0.000	0.000
66.00 0.744	0.000	0.000	0.000
66.20 0.760	0.000	0.000	0.000
66.40 0.776	0.000	0.000	0.000
66.60 0.792	0.000	0.000	0.000
66.80 0.808	0.000	0.000	0.000
67.00 0.824	0.000	0.000	0.000
67.20 0.840	0.000	0.000	0.000
67.40 0.856	0.000	0.000	0.000
67.60 0.872	0.000	0.000	0.000
67.80 0.888	0.000	0.000	0.000
68.00 0.904	0.000	0.000	0.000
68.20 0.920	0.000	0.000	0.000
68.40 0.936	0.000	0.000	0.000
68.60 0.952	0.000	0.000	0.000
68.80 0.968	0.000	0.000	0.000
69.00 0.984	0.000	0.000	0.000
69.20 0.100	0.000	0.000	0.000
69.40 0.116	0.000	0.000	0.000
69.60 0.132	0.000	0.000	0.000
69.80 0.148	0.000	0.000	0.000
70.00 0.164	0.000	0.000	0.000
70.20 0.180	0.000	0.000	0.000
70.40 0.196	0.000	0.000	0.000
70.60 0.212	0.000	0.000	0.000
70.80 0.228	0.000	0.000	0.000
71.00 0.244	0.000	0.000	0.000
71.20 0.260	0.000	0.000	0.000
71.40 0.276	0.000	0.000	0.000
71.60 0.292	0.000	0.000	0.000
71.80 0.308	0.000	0.000	0.000
72.00 0.324	0.000	0.000	0.000
72.20 0.340	0.000	0.000	0.000
72.40 0.356	0.000	0.000	0.000
72.60 0.372	0.000	0.000	0.000
72.80 0.388	0.000	0.000	0.000
73.00 0.404	0.000	0.000	0.000
73.20 0.420	0.000	0.000	0.000
73.40 0.436	0.000	0.000	0.000
73.60 0.452	0.000	0.000	0.000
73.80 0.468	0.000	0.000	0.000
74.00 0.484	0.000	0.000	0.000
74.20 0.500	0.000	0.000	0.000
74.40 0.516	0.000	0.000	0.000
74.60 0.532	0.000	0.000	0.000
74.80 0.548	0.000	0.000	0.000
75.00 0.564	0.000	0.000	0.000
75.20 0.580	0.000	0.000	0.000
75.40 0.596	0.000	0.000	0.000
75.60 0.612	0.000	0.000	0.000
75.80 0.628	0.000	0.000	0.000
76.00 0.644	0.000	0.000	0.000
76.20 0.660	0.000	0.000	0.000
76.40 0.676	0.000	0.000	0.000
76.60 0.692	0.000	0.000	0.000
76.80 0.708	0.000	0.000	0.000
77.00 0.724	0.000	0.000	0.000
77.20 0.740	0.000	0.000	0.000
77.40 0.756	0.000	0.000	0.000
77.60 0.772	0.000	0.000	0.000
77.80 0.788	0.000	0.000	0.000
78.00 0.804	0.000	0.000	0.000
78.20 0.820	0.000	0.000	0.000
78.40 0.836	0.000	0.000	0.000
78.60 0.852	0.000	0.000	0.000
78.80 0.868	0.000	0.000	0.000
79.00 0.884	0.000	0.000	0.000
79.20 0.900	0.000	0.000	0.000
79.40 0.916	0.000	0.000	0.000
79.60 0.932	0.0		



# Culvert Designer/Analyzer Report

## ES-5 TO MH-22

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**Analysis Component**


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Storm Event	Design	Discharge	150.00 cfs
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**Peak Discharge Method:**
User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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**Tailwater properties:**
Trapezoidal Channel


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**Tailwater conditions for  
Design Storm.**

Discharge	150.00 cfs	Bottom Elevation	24.27 ft
Depth	2.38 ft	Velocity	4.66 ft/s

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Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-27 inch Circular	150.00 cfs	134.60 ft	37.73 ft/s
Weir	Not Considered	N/A	N/A	N/A

# Culvert Designer/Analyzer Report

## ES-5 TO MH-22

Component:Culvert-1

### Culvert Summary

Computed Headwater Elevation	134.60 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	67.62 ft	Tailwater Elevation	26.65 ft
Outlet Control HW Elev.	134.60 ft	Control Type	Outlet Control
Headwater Depth/Height	45.96		

### Grades

Upstream Invert Length	31.19 ft 347.00 ft	Downstream Invert Constructed Slope	24.27 ft 0.019942 ft/ft
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### Hydraulic Profile

Profile	Pressure Profile	Depth, Downstream	2.38 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

### Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

### Outlet Control Properties

Outlet Control HW Elev.	134.60 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

### Inlet Control Properties

Inlet Control HW Elev.	67.62 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

# Culvert Designer/Analyzer Report

## MH-22 TO MH-1

### Analysis Component

Storm Event	Design	Discharge	150.00 cfs
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### Peak Discharge Method:

User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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### Tailwater Conditions:

#### Tailwater Rating

Discharge (cfs)	TW Elev. (ft)
0.00	31.19
10.00	32.79
20.00	33.61
30.00	34.42
40.00	35.49
50.00	38.48
60.00	43.78
70.00	50.02
80.00	57.22
90.00	65.38
100.00	74.50
110.00	84.57
120.00	95.61
130.00	107.60
140.00	120.61
150.00	134.60

Name	Description	HW Elev.	Velocity
		Discharge	
Culvert-1	1-27 inch Circular	150.00 cfs	37.73 ft/s
Weir	Not Considered	N/A	N/A

# Culvert Designer/Analyzer Report

## MH-22 TO MH-1

Component:Culvert-1

### Culvert Summary

Computed Headwater Elevation	174.61 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	134.60 ft	Tailwater Elevation	134.60 ft
Outlet Control HW Elev.	174.61 ft	Control Type	Outlet Control
Headwater Depth/Height	63.26		

### Grades

Upstream Invert Length	32.28 ft 57.40 ft	Downstream Invert Constructed Slope	31.29 ft 0.017247 ft/ft
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### Hydraulic Profile

Profile	Pressure Profile	Depth, Downstream	103.31 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

### Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

### Outlet Control Properties

Outlet Control HW Elev.	174.61 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

### Inlet Control Properties

Inlet Control HW Elev.	134.60 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

# Culvert Designer/Analyzer Report

## MH-1 TO MH-2

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**Analysis Component**

Storm Event	Design	Discharge	150.00 cfs
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**Peak Discharge Method:**

User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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**Tailwater Conditions:**
**Tailwater Rating**

Discharge (cfs)	TW Elev. (ft)
0.00	32.28
10.00	33.88
20.00	34.70
30.00	36.02
40.00	38.33
50.00	42.93
60.00	50.18
70.00	58.73
80.00	68.60
90.00	79.78
100.00	92.28
110.00	106.09
120.00	121.21
130.00	137.65
140.00	155.46
150.00	174.61

Name	Description	HW Elev.      Velocity		
		Discharge		
Culvert-1	1-27 inch Circular	150.00 cfs	229.56 ft	37.73 ft/s
Weir	Not Considered	N/A	N/A	N/A

# Culvert Designer/Analyzer Report

## MH-1 TO MH-2

Component:Culvert-1

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### Culvert Summary

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Computed Headwater Elevation	229.56 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	174.61 ft	Tailwater Elevation	174.61 ft
Outlet Control HW Elev.	229.56 ft	Control Type	Outlet Control
Headwater Depth/Height	87.07		

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### Grades

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Upstream Invert Length	33.66 ft 121.10 ft	Downstream Invert Constructed Slope	32.50 ft 0.009579 ft/ft
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### Hydraulic Profile

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Profile	Pressure Profile	Depth, Downstream	142.11 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

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### Section

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Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

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### Outlet Control Properties

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Outlet Control HW Elev.	229.56 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

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### Inlet Control Properties

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Inlet Control HW Elev.	174.61 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

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# Culvert Designer/Analyzer Report

## MH-2 TO MH-3

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**Analysis Component**


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Storm Event	Design	Discharge	150.00 cfs
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**Peak Discharge Method:**

User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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**Tailwater Conditions:**
**Tailwater Rating**

Discharge (cfs)	TW Elev. (ft)
0.00	33.66
10.00	35.26
20.00	36.08
30.00	38.22
40.00	42.24
50.00	49.04
60.00	58.97
70.00	70.70
80.00	84.23
90.00	99.56
100.00	116.70
110.00	135.64
120.00	156.38
130.00	178.92
140.00	203.33
150.00	229.56

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-27 inch Circular	150.00 cfs	309.97 ft	37.73 ft/s
Weir	Not Considered	N/A	N/A	N/A

# Culvert Designer/Analyzer Report

## MH-2 TO MH-3

Component:Culvert-1

### Culvert Summary

Computed Headwater Elevation	309.97 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	229.56 ft	Tailwater Elevation	229.56 ft
Outlet Control HW Elev.	309.97 ft	Control Type	Outlet Control
Headwater Depth/Height	122.26		

### Grades

Upstream Invert Length	34.88 ft 229.60 ft	Downstream Invert Constructed Slope	33.73 ft 0.005009 ft/ft
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### Hydraulic Profile

Profile	Pressure Profile	Depth, Downstream	195.83 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

### Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

### Outlet Control Properties

Outlet Control HW Elev.	309.97 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

### Inlet Control Properties

Inlet Control HW Elev.	229.56 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

# Culvert Designer/Analyzer Report

## MH-3 TO MH-4

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**Analysis Component**


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Storm Event	Design	Discharge	150.00 cfs
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**Peak Discharge Method:**

User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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**Tailwater Conditions:**
**Tailwater Rating**

Discharge (cfs)	TW Elev. (ft)
0.00	34.88
10.00	36.48
20.00	37.48
30.00	41.44
40.00	47.96
50.00	57.97
60.00	71.84
70.00	88.21
80.00	107.10
90.00	128.51
100.00	152.44
110.00	178.88
120.00	207.84
130.00	239.31
140.00	273.37
150.00	309.97

Name	Description	HW Elev. Velocity		
		Discharge		
Culvert-1	1-27 inch Circular	150.00 cfs	393.45 ft	37.73 ft/s
Weir	Not Considered	N/A	N/A	N/A

# Culvert Designer/Analyzer Report

## MH-3 TO MH-4

Component:Culvert-1

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### Culvert Summary

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Computed Headwater Elevation	393.45 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	309.97 ft	Tailwater Elevation	309.97 ft
Outlet Control HW Elev.	393.45 ft	Control Type	Outlet Control
Headwater Depth/Height	158.73		

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### Grades

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Upstream Invert Length	36.30 ft 242.70 ft	Downstream Invert Constructed Slope	35.03 ft 0.005233 ft/ft
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### Hydraulic Profile

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Profile	Pressure Profile	Depth, Downstream	274.94 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

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### Section

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Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

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### Outlet Control Properties

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Outlet Control HW Elev.	393.45 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

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### Inlet Control Properties

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Inlet Control HW Elev.	309.97 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

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# Culvert Designer/Analyzer Report

## MH-4 TO R-5

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**Analysis Component**


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Storm Event	Design	Discharge	150.00 cfs
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**Peak Discharge Method:**

User-Specified

Design Discharge	150.00 cfs	Check Discharge	150.00 cfs
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**Tailwater Conditions:**
**Tailwater Rating**

Discharge (cfs)	TW Elev. (ft)
0.00	36.30
10.00	37.90
20.00	38.95
30.00	44.78
40.00	53.90
50.00	67.25
60.00	85.20
70.00	106.39
80.00	130.85
90.00	158.56
100.00	189.54
110.00	223.77
120.00	261.27
130.00	302.01
140.00	346.09
150.00	393.45

Name	Description	HW Elev. Velocity		
		Discharge		
Culvert-1	1-27 inch Circular	150.00 cfs	433.13 ft	37.73 ft/s
Weir	Not Considered	N/A	N/A	N/A

# Culvert Designer/Analyzer Report

## MH-4 TO R-5

Component:Culvert-1

### Culvert Summary

Computed Headwater Elevation	433.13 ft	Discharge	150.00 cfs
Inlet Control HW Elev.	393.45 ft	Tailwater Elevation	393.45 ft
Outlet Control HW Elev.	433.13 ft	Control Type	Outlet Control
Headwater Depth/Height	176.18		

### Grades

Upstream Invert Length	36.72 ft 56.00 ft	Downstream Invert Constructed Slope	36.38 ft 0.006071 ft/ft
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### Hydraulic Profile

Profile	Pressure Profile	Depth, Downstream	357.07 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.25 ft
Velocity Downstream	37.73 ft/s	Critical Slope	0.230225 ft/ft

### Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	CMP	Span	2.25 ft
Section Size	27 inch	Rise	2.25 ft
Number Sections	1		

### Outlet Control Properties

Outlet Control HW Elev.	433.13 ft	Upstream Velocity Head	22.12 ft
Ke	0.20	Entrance Loss	4.42 ft

### Inlet Control Properties

Inlet Control HW Elev.	393.45 ft	Flow Control	Submerged
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels	Area Full	4.0 ft <sup>2</sup>
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	B
C	0.02430	Equation Form	1
Y	0.83000		

# Rating Table Report

## MH-4 TO R-5

Range Data:

Discharge	Minimum	Maximum	Increment
	0.00	32.00	0.20 cfs

Discharge (cfs)	HW Elev. (ft)	TW Elev. (ft)
0.00	36.72	36.30
0.20	36.93	36.33
0.40	37.02	36.36
0.60	37.08	36.40
0.80	37.14	36.43
1.00	37.19	36.46
1.20	37.24	36.49
1.40	37.28	36.52
1.60	37.32	36.56
1.80	37.36	36.59
2.00	37.39	36.62
2.20	37.43	36.65
2.40	37.46	36.68
2.60	37.49	36.72
2.80	37.52	36.75
3.00	37.55	36.78
3.20	37.58	36.81
3.40	37.61	36.84
3.60	37.64	36.88
3.80	37.66	36.91
4.00	37.69	36.94
4.20	37.72	36.97
4.40	37.74	37.00
4.60	37.77	37.04
4.80	37.79	37.07
5.00	37.81	37.10
5.20	37.84	37.13
5.40	37.86	37.16
5.60	37.88	37.20
5.80	37.91	37.23
6.00	37.93	37.26
6.20	37.95	37.29
6.40	37.97	37.32
6.60	37.99	37.36
6.80	38.01	37.39
7.00	38.03	37.42
7.20	38.05	37.45
7.40	38.07	37.48
7.60	38.09	37.52
7.80	38.11	37.55
8.00	38.13	37.58
8.20	38.15	37.61
8.40	38.17	37.64
8.60	38.19	37.68
8.80	38.21	37.71
9.00	38.23	37.74
9.20	38.25	37.77

## Rating Table Report

### MH-4 TO R-5

Discharge (cfs)	HW Elev. (ft)	TW Elev. (ft)
9.40	38.27	37.80
9.60	38.28	37.84
9.80	38.30	37.87
10.00	38.32	37.90
10.20	38.34	37.92
10.40	38.35	37.94
10.60	38.37	37.96
10.80	38.39	37.98
11.00	38.41	38.01
11.20	38.43	38.03
11.40	38.45	38.05
11.60	38.47	38.07
11.80	38.49	38.09
12.00	38.51	38.11
12.20	38.53	38.13
12.40	38.56	38.15
12.60	38.58	38.17
12.80	38.60	38.19
13.00	38.62	38.22
13.20	38.64	38.24
13.40	38.67	38.26
13.60	38.69	38.28
13.80	38.71	38.30
14.00	38.74	38.32
14.20	38.76	38.34
14.40	38.78	38.36
14.60	38.81	38.38
14.80	38.83	38.40
15.00	38.86	38.43
15.20	38.88	38.45
15.40	38.91	38.47
15.60	38.93	38.49
15.80	38.96	38.51
16.00	38.99	38.53
16.20	39.01	38.55
16.40	39.04	38.57
16.60	39.07	38.59
16.80	39.10	38.61
17.00	39.14	38.64
17.20	39.17	38.66
17.40	39.20	38.68
17.60	39.24	38.70
17.80	39.27	38.72
18.00	39.31	38.74
18.20	39.34	38.76
18.40	39.38	38.78
18.60	39.41	38.80
18.80	39.45	38.82
19.00	39.48	38.85
19.20	39.52	38.87
19.40	39.55	38.89
19.60	39.59	38.91

## Rating Table Report

### MH-4 TO R-5

Discharge (cfs)	HW Elev. (ft)	TW Elev. (ft)
19.80	39.62	38.93
20.00	39.66	38.95
20.20	39.79	39.07
20.40	39.92	39.18
20.60	40.05	39.30
20.80	40.18	39.42
21.00	40.31	39.53
21.20	40.44	39.65
21.40	40.57	39.77
21.60	40.71	39.88
21.80	40.84	40.00
22.00	40.97	40.12
22.20	41.10	40.23
22.40	41.23	40.35
22.60	41.37	40.47
22.80	41.50	40.58
23.00	41.63	40.70
23.20	41.76	40.82
23.40	41.90	40.93
23.60	42.03	41.05
23.80	42.16	41.17
24.00	42.30	41.28
24.20	42.43	41.40
24.40	42.57	41.52
24.60	42.70	41.63
24.80	42.83	41.75
25.00	42.97	41.87
25.20	43.10	41.98
25.40	43.24	42.10
25.60	43.37	42.21
25.80	43.51	42.33
26.00	43.64	42.45
26.20	43.78	42.56
26.40	43.91	42.68
26.60	44.05	42.80
26.80	44.18	42.91
27.00	44.32	43.03
27.20	44.45	43.15
27.40	44.59	43.26
27.60	44.72	43.38
27.80	44.86	43.50
28.00	45.00	43.61
28.20	45.13	43.73
28.40	45.27	43.85
28.60	45.41	43.96
28.80	45.54	44.08
29.00	45.68	44.20
29.20	45.82	44.31
29.40	45.95	44.43
29.60	46.09	44.55
29.80	46.23	44.66
30.00	46.37	44.78

## Rating Table Report MH-4 TO R-5

Discharge (cfs)	HW Elev. (ft)	TW Elev. (ft)
30.20	46.57	44.96
30.40	46.77	45.14
30.60	46.98	45.33
30.80	47.18	45.51
31.00	47.39	45.69
31.20	47.59	45.87
31.40	47.80	46.06
31.60	48.00	46.24
31.80	48.20	46.42
32.00	48.41	46.60

# Bay Engineering, Inc.

## Bay Village

### Stage Storage for 100 year worst case

Stage	Delta H	Area	Ave. Area	Gross Storage	Net Storage, Ac. Ft.	Cumulative Storage (ac-ft)	Pond Cumulative Storage (cf)	Pond and Pipe Trench		
								Pipe/Trench Net Storage (ac-ft)	Pond Net Storage (ac-ft)	Cumulative Storage (cf)
37.80	0.00	3789	0	0	0.00000	0.00000	0.00	0.0000	0	0.00
37.80	0.20	4080	3935	787	0.00000	0.00000	0.00	0.0000	0.00000	0.00
38.00	0.20	4371	4226	845	0.00000	0.00000	0.00	0.0000	0.00000	0.00
38.20	0.20	4704	4538	908	0.00000	0.00000	0.00	0.0000	0.00000	0.00
38.40	0.20	5038	4871	974	0.00000	0.00000	0.00	0.0000	0.00000	0.00
38.60	0.20	5371	5205	1041	0.00000	0.00000	0.00	0.0000	0.00000	0.00
38.80	0.20	5705	5538	1108	0.00000	0.00000	0.00	0.0000	0.00000	0.00
39.00	0.20	6038	5871	1174	0.00000	0.00000	0.00	0.0000	0.00000	0.00
39.20	0.20	6366	6202	1240	0.00000	0.00000	0.00	0.0000	0.00000	0.00
39.40	0.20	6694	6530	1306	0.00000	0.00000	0.00	0.0000	0.00000	0.00
39.60	0.20	7021	6858	1372	0.00000	0.00000	0.00	0.0000	0.00000	0.00
39.80	0.20	7349	7185	1437	0.00000	0.00000	0.00	0.0000	0.00000	0.00
40.00	0.20	7677	7513	1503	0.00000	0.00000	0.00	0.0000	0.00000	0.00
40.20	0.20	7993	7835	1567	0.03597	0.03597	1566.96	0.0586	0.09459	4120.25
40.40	0.20	8308	8150	1630	0.03742	0.07339	3197.04	0.0580	0.19000	8276.53
40.60	0.20	8624	8466	1693	0.03887	0.11226	4890.24	0.0567	0.28562	12441.75
40.80	0.20	8939	8782	1756	0.04032	0.15258	6646.56	0.0558	0.38176	16629.46
41.00	0.20	9255	9097	1819	0.04177	0.19435	8466.00	0.0543	0.47779	20812.58
41.20	0.20	9577	9416	1883	0.04323	0.23758	10349.20	0.0524	0.57342	24978.18
41.40	0.20	9899	9738	1948	0.04471	0.28230	12296.80	0.0499	0.66804	29099.84
41.60	0.20	10221	10060	2012	0.04619	0.32848	14308.80	0.0471	0.76134	33164.00
42.00	0.20	10865	10704	2141	0.04915	0.42530	18526.00	0.0365	0.93776	40848.95
42.20	0.20	11215	11040	2208	0.05069	0.47599	20734.02	0.0285	1.01691	44296.49
42.40	0.20	11565	11390	2278	0.05230	0.52828	23012.08	0.0285	1.09766	47814.07
42.60	0.20	11916	11741	2348	0.05390	0.58219	25360.18	0.0142	1.16579	50781.93
42.80	0.20	12266	12091	2418	0.05551	0.63770	27778.32	0.0000	1.22131	53200.07
43.00	0.20	12616	12441	2488	0.05712	0.69482	30266.50	0.0000	1.27843	55688.25
43.20	0.20	12958	12787	2557	0.05871	0.75353	32823.90	0.0000	1.33714	58245.65
43.40	0.20	13300	13129	2626	0.06028	0.81381	35449.70	0.0000	1.39742	60871.45
43.60	0.20	13642	13471	2694	0.06185	0.87566	38143.90	0.0000	1.45927	63565.65
43.80	0.20	13984	13813	2763	0.06342	0.93908	40906.50	0.0000	1.52269	66328.25
44.00	0.20	14326	14155	2831	0.06499	1.00407	43737.50	0.0000	1.58768	69159.25
44.20	0.20	14668	14497	2899	0.06656	1.07064	46636.90	0.0000	1.65424	72058.65
44.40	0.20	15010	14839	2968	0.06813	1.13877	49604.70	0.0000	1.72237	75026.45
44.60	0.20	15352	15181	3036	0.06970	1.20847	52640.90	0.0000	1.79207	78062.65
44.80	0.20	15694	15523	3105	0.07127	1.27974	55745.50	0.0000	1.86334	81167.25
45.00	0.20	16129	15912	3182	0.07306	1.35280	58927.80	0.0000	1.93640	84349.55
45.20	0.20	16499	16314	3263	0.07490	1.42770	62190.60	0.0000	2.01130	87612.35
45.40	0.20	16869	16684	3337	0.07660	1.50430	65527.40	0.0000	2.08791	90949.15
45.60	0.20	17239	17054	3411	0.07830	1.58260	68938.20	0.0000	2.16621	94359.95
45.80	0.20	17239	17054	3411	0.07830	1.66090	72349.00	0.0000	2.24451	97770.75
45.80	0.20	17609	17424	3485	0.08000	1.74090	75833.80	0.0000	2.32451	101255.55
46.00	0.20	17979	17794	3559	0.08170	1.82260	79392.60	0.0000	2.40621	104814.35
46.20	0.20	18356	18168	3634	0.08341	1.90602	83026.10	0.0000	2.48962	108447.85
46.40	0.20	18733	18545	3709	0.08514	1.99116	86735.00	0.0000	2.57476	112156.75
46.60	0.20	19110	18922	3784	0.08688	2.07804	90519.30	0.0000	2.66164	115941.05
46.80	0.20	19487	19299	3860	0.08861	2.16664	94379.00	0.0000	2.75025	119800.75
47.00	0.20	19864	19676	3935	0.09034	2.25698	98314.10	0.0000	2.84058	123735.85
47.20	0.20	20270	20067	4013	0.09214	2.34912	102327.52	0.0000	2.93272	127749.27
47.40	0.20	20676	20473	4095	0.09400	2.44312	106422.18	0.0000	3.02672	131843.93
47.60	0.20	21083	20880	4176	0.09587	2.53898	110598.08	0.0000	3.12259	136019.83
47.80	0.20	21489	21286	4257	0.09773	2.63671	114855.22	0.0000	3.22032	140276.97
48.00	0.20	21895	21692	4338	0.09960	2.73631	119193.60	0.0000	3.31991	144615.35
48.20	0.20	21502	21698	4340	0.09962	2.83593	123533.26	0.0000	3.41954	148955.01
48.40	0.20	21108	21305	4261	0.09782	2.93375	127794.24	0.0000	3.51736	153215.99
48.60	0.20	20715	20912	4182	0.09601	3.02976	131976.54	0.0000	3.61337	157398.29
48.80	0.20	20321	20518	4104	0.09421	3.12397	136080.16	0.0000	3.70757	161501.91
49.00	0.20	23862	22092	4418	0.10143	3.22540	140498.50	0.0000	3.80900	165920.25



45.00	0.000	45.00	45.00	4.149	21.832	0.000	0.000	0.000	0.000	21.8321	45.00	51.21	4.990	7.155	47.577	21.8321	Riser Control
45.20	weir	4.180	4.180	22.077	45.20	0.000	0.000	0.000	0.000	22.0772	45.20	51.92	5.040	47.815	47.815	22.0772	Riser Control
45.40	weir	4.214	4.214	22.347	45.40	0.000	0.000	0.000	0.000	22.3472	45.40	52.62	5.080	48.052	48.052	22.3472	Riser Control
45.60	weir	4.100	4.100	21.446	45.60	weir	0.100	1.372	22.8189	45.60	7.755	53.31	5.020	47.720	47.720	22.8189	Riser Control
45.80	weir	3.496	3.496	16.886	45.80	weir	0.300	7.131	24.0178	45.80	7.955	54.00	4.520	45.281	45.281	24.0178	Riser Control
46.00	weir	2.530	0.000	46.00	46.00	weir	0.500	15.344	25.7401	46.00	8.155	54.67	3.700	40.97	40.969	25.7401	Riser Control
46.20	weir	1.056	0.000	46.20	46.20	weir	0.700	25.418	26.2211	46.20	8.355	55.34	2.470	33.47	33.47	26.2211	Riser Control
46.40	weir	0.735	0.000	46.40	46.40	weir	0.735	27.353	26.9814	46.40	8.555	56.00	2.220	31.73	31.73	28.9814	Riser Control
46.60	weir	0.740	0.000	46.60	46.60	weir	0.740	27.616	28.2598	46.60	8.755	56.65	2.250	31.948	31.948	29.2598	Riser Control
46.80	weir	0.745	0.000	46.80	46.80	weir	0.745	27.902	28.5629	46.80	8.955	57.29	2.280	32.16	32.16	29.5629	Riser Control
47.00	weir	0.749	0.000	47.00	47.00	weir	0.749	28.133	28.8073	47.00	9.155	57.93	2.320	32.44	32.44	29.8073	Riser Control
47.20	weir	0.754	0.000	47.20	47.20	weir	0.754	28.387	30.0764	47.20	9.355	58.56	2.350	32.65	32.65	30.0764	Riser Control
47.40	weir	0.757	0.000	47.40	47.40	weir	0.757	28.562	30.2622	47.40	9.555	59.18	2.370	32.78	32.78	30.2622	Riser Control
47.60	weir	0.760	0.000	47.60	47.60	weir	0.760	28.755	30.4664	47.60	9.755	59.79	2.400	33.00	32.986	30.4664	Riser Control
47.80	weir	0.763	0.000	47.80	47.80	weir	0.763	28.925	30.5469	47.80	9.955	60.40	2.430	33.20	33.20	30.5469	Riser Control
48.00	weir	0.766	0.000	48.00	48.00	weir	0.766	29.096	30.6279	48.00	10.155	61.01	2.450	33.34	33.338	30.6279	Riser Control
48.20	weir	0.770	0.000	48.20	48.20	weir	0.770	29.296	31.0394	48.20	10.355	61.61	2.470	33.47	33.47	31.0394	Riser Control
48.40	weir	0.773	0.000	48.40	48.40	weir	0.773	29.496	31.2514	48.40	10.555	62.20	2.490	33.61	33.609	31.2514	Riser Control
48.60	weir	0.776	0.000	48.60	48.60	weir	0.776	29.688	31.4335	48.60	10.755	62.78	2.520	33.81	33.811	31.4335	Riser Control
48.80	weir	0.779	0.000	48.80	48.80	weir	0.779	29.840	31.6150	48.80	10.955	63.37	2.540	33.94	33.944	31.6160	Riser Control
49.00	weir	0.783	0.000	49.00	49.00	weir	0.783	30.041	31.8293	49.00	11.155	63.94	2.560	34.08	34.078	31.8293	Riser Control

Note: The following equations are used to calculate the above values.

$$Q = \text{Coeff} \times \text{Area} \times 2gh^{1/2}$$

$$\text{Coeff} = \frac{C}{\sqrt{2g}}$$

$$C = \text{Coeff} \times \text{Weir Length} \times h^{1/2}$$

$$\text{Coeff} = \frac{Q}{\text{Area} \times h^{1/2}}$$

$$h = \frac{Q^2}{g \cdot \text{Coeff}^2 \cdot \text{Area}^2}$$

$$h = \frac{Q^2}{g \cdot C^2 \cdot A^2}$$

$$h = \frac{Q^2}{g \cdot \left(\frac{Q}{\text{Coeff} \cdot \text{Area}}\right)^2}$$

$$h = \frac{Q^2}{g \cdot \left(\frac{C}{\sqrt{2g}} \cdot \text{Length}\right)^2}$$

$$h = \frac{Q^2}{g \cdot \left(\frac{C}{\sqrt{2g}} \cdot \text{Length}\right)^2}$$

# **Appendix E**

# **Wetland Computations**

# Bay Engineering, Inc.

## Bay Village Existing onsite Wetland

Note that storage begins at weir elevation

Stage	Delta H	Area	Ave. Area	Gross Storage	Net	Cumulative	Cumulative Storage (ac- ft)	Cumulative Storage (cf)
					Storage, Ac. Ft.	ft)		
49.00	0.00	1680	0	0	0.00000	0.00000	0.00	0.00
49.20	0.20	16093	8886	1777	0.04080	0.00000	0.00	0.00
49.40	0.20	30505	23299	4660	0.10697	0.00000	0.00	0.00
49.60	0.20	44918	37712	7542	0.17315	0.00000	0.00	0.00
49.80	0.20	59330	52124	10425	0.23932	0.00000	0.00	0.00
50.00	0.20	73743	66537	13307	0.30549	0.00000	0.00	0.00
50.20	0.20	80742	77242	15448	0.35465	0.00000	0.00	0.00
50.40	0.20	87740	84241	16848	0.38678	0.00000	0.00	0.00
50.60	0.20	94739	91240	18248	0.41891	0.00000	0.00	0.00
50.80	0.20	101737	98238	19648	0.45105	0.00000	0.00	0.00
51.00	0.20	108736	105237	21047	0.48318	0.00000	0.00	0.00
51.20	0.20	118090	113413	22683	0.52072	0.00000	0.00	0.00
51.40	0.20	127444	122767	24553	0.56367	0.00000	0.00	0.00
51.50	0.10	131338	129391	12939	0.29704	0.00000	0.00	0.00
51.60	0.10	135231	133284	13328	0.30598	0.30598	13328.43	
51.80	0.20	143018	139125	27825	0.63877	0.94475	41153.33	
52.00	0.20	150805	146912	29382	0.67452	1.61928	70535.63	



# Bay Engineering, Inc.

## Bay Village Developed onsite Wetland

Stage	Delta H	Area	Ave. Area	Gross Storage	Net	Cumulative	Cumulative Storage (ac-ft)	Cumulative Storage (cf)
					Storage, Ac. Ft.	ft)		
49.00	0.00	1680	0	0	0.00000	0.00000	0.00	0.00
49.20	0.20	15975	8827	1765	0.04053	0.00000	0.00	0.00
49.40	0.20	30270	23122	4624	0.10616	0.00000	0.00	0.00
49.60	0.20	44564	37417	7483	0.17180	0.00000	0.00	0.00
49.80	0.20	58859	51712	10342	0.23743	0.00000	0.00	0.00
50.00	0.20	73154	66007	13201	0.30306	0.00000	0.00	0.00
50.20	0.20	79880	76517	15303	0.35132	0.35132	15303.44	
50.40	0.20	86607	83244	16649	0.38220	0.73352	31952.16	
50.60	0.20	93333	89970	17994	0.41309	1.14661	49946.16	
50.80	0.20	100060	96696	19339	0.44397	1.59057	69285.44	
51.00	0.20	106786	103423	20685	0.47485	2.06543	89970.00	
51.20	0.20	115067	110927	22185	0.50930	2.57473	112155.30	
51.40	0.20	123348	119208	23842	0.54733	3.12206	135996.80	
51.60	0.20	130199	126774	25355	0.58206	3.70412	161351.53	
51.80	0.20	137051	133625	26725	0.61352	4.31764	188076.53	
52.00	0.20	143902	140476	28095	0.64498	4.96262	216171.80	

**STAGE DISCHARGE COMPUTATIONS  
FOR EXISTING WETLAND**

Opening submerged

Development	Bay Village	Date
Location	Anne Arundel County	Computed by
Job No.	15-5208	12/05/15 JKC
LS20_Flow_Coeff_14.5_Diameter_Opening	Weir #1 [24" notch in front of 14"]	LS20_Openings_at_all four sides
Weir Length (inches)	0.00	Weir Length (inches)
Orifice Height (inches)	0.00	Orifice Height (inches)
Invert Elevation	0.00	Invert Elevation
Orifice Ceff.	0.00	Orifice Ceff.
Weir Ceff.	0.00	Weir Ceff.
Orifice Diameter (inches)	0.00	Orifice Diameter (inches)
WSE in Pond	49.00	WSE in Pond
Condition	weir	Condition
Head (ft.)	49.00	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	49.20	WSE in Pond
Condition	weir	Condition
Head (ft.)	49.20	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	49.40	WSE in Pond
Condition	weir	Condition
Head (ft.)	49.40	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	49.60	WSE in Pond
Condition	weir	Condition
Head (ft.)	49.60	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	49.80	WSE in Pond
Condition	weir	Condition
Head (ft.)	49.80	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	50.00	WSE in Pond
Condition	weir	Condition
Head (ft.)	50.00	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	50.20	WSE in Pond
Condition	weir	Condition
Head (ft.)	50.20	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	50.40	WSE in Pond
Condition	weir	Condition
Head (ft.)	50.40	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	50.60	WSE in Pond
Condition	weir	Condition
Head (ft.)	50.60	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	50.80	WSE in Pond
Condition	weir	Condition
Head (ft.)	50.80	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	51.00	WSE in Pond
Condition	weir	Condition
Head (ft.)	51.00	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	51.20	WSE in Pond
Condition	weir	Condition
Head (ft.)	51.20	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	51.40	WSE in Pond
Condition	weir	Condition
Head (ft.)	51.40	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	51.60	WSE in Pond
Condition	weir	Condition
Head (ft.)	51.60	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	51.80	WSE in Pond
Condition	weir	Condition
Head (ft.)	51.80	Head (ft.)
Q (cfs)	0.000	Q (cfs)
WSE in Pond	52.00	WSE in Pond
Condition	weir	Condition
Head (ft.)	52.00	Head (ft.)
Q (cfs)	0.000	Q (cfs)

Note: The following equations are used to calculate the above values:

$$Q = Ceff \times Area \times 2gh^{1/2}$$

$$Q = Ceff \times Weir Length \times h^{1/2}$$

$$Q = Ceff \times Area \times 2gh^{1/2}$$

$$Q = Area \times [2gh / (1 + km + kP)]^{1/2}$$

Weir #1 (to north)

Weir Length at crest

Side slopes

Invert Elevation

Trapezoidal Weir with rip rap

Barrel		No ADS		Total Release	
Size (inches)	Length (ft.)	Size (inches)	Length (ft.)	Q (cfs) pas. from Riser Flowmeter and Spillway	Head (ft.)
0.00	0.00	0.00	0.00	0.00	0.00
Kp	Kp	Kp	Kp	0.000	0.000
Barrel Invert Elevation	Barrel Invert Out Elevation	Barrel Invert Elevation	Barrel Invert Elevation	0.000	0.000
Orifice Ceff.	Orifice Ceff.	Orifice Ceff.	Orifice Ceff.	0.000	0.000
Area (sq ft)	Area (sq ft)	Area (sq ft)	Area (sq ft)	0.000	0.000
7.07	7.07	7.07	7.07	0.000	0.000
				(Per attached Culvert Analysis)	(Per attached Culvert Analysis)
Indet Control	Outlet Control	Release from Bond	Bond Capacity Q (cfs)	Overall Control Bond (cfs)	Head (ft.)
WSE at HW	Tailwater Elev.	WSE at HW	Tailwater Elev.	WSE at HW	Tailwater Elev.
Total Capacity from Openings					
WSE in Pond	Head (ft.)	Q (cfs)	Head (ft.)	Q (cfs)	Head (ft.)
49.00	49.00	0.000	49.00	0.000	0.00
49.20	49.20	0.000	49.20	0.000	0.00
49.40	49.40	0.000	49.40	0.000	0.00
49.60	49.60	0.000	49.60	0.000	0.00
49.80	49.80	0.000	49.80	0.000	0.00
50.00	50.00	0.000	50.00	0.000	0.00
50.20	50.20	0.000	50.20	0.000	0.00
50.40	50.40	0.000	50.40	0.000	0.00
50.60	50.60	0.000	50.60	0.000	0.00
50.80	50.80	0.000	50.80	0.000	0.00
51.00	51.00	0.000	51.00	0.000	0.00
51.20	51.20	0.000	51.20	0.000	0.00
51.40	51.40	0.000	51.40	0.000	0.00
51.60	51.60	0.000	51.60	0.100	10.99
51.80	51.80	0.000	51.80	0.300	20.57
52.00	52.00	0.000	52.00	0.500	32.05

# **Appendix F**

# **Storm Drain Computations**

DEVELOPMENT  
LOCATION  
STORM FREQUENCIES:  
JOB NO.:  
BAY VILLAGE LOT 4  
ANNE ARUNDEL COUNTY / CITY OF ANNAPOLIS  
10 YEAR  
15-5208

LOT 4 POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS  
DATE  
SHEET  
COMPUTED BY  
CHECKED BY

12/11/2015  
1  
JC

LOCATION	AREA	ACRES	COEF	CA	SUM C.A.	TIME	CONC	MIN	PIPE			REMARKS									
									INLET	DRAIN	TOTAL										
FROM	TO	SUB	TOTAL	"C"	C.A.				Q=CIA C.F.S.	SIZE	Type	N	SLOPE	VEL	LEN	DT					
Surface	EX-13	60	6.79	0.81	5.50	6.29	0.00	13.70	3.98	6.25	34.92	42	RCP	0.013	0.12	3.6	21.00	0.10			
EX-13	MH-56A	60	6.79								34.92						SUMP				
Surface	I-56	56	0.15	0.81	0.12	0.14	5.00	0.00	5.00	7.00	8.00	0.97						SUMP			
I-56	MH-56A	56	0.15															SUMP			
Surface	EX-MH-12	56,60	6.94						6.43	13.70	10	13.80	5.55	35.70	42	RCP	0.013	0.13	3.7	42.00	0.19
Surface	I-59	59	0.11	0.81	0.09	0.10	5.00	0.00	5.00	7.00	8.00	0.71						SUMP			
I-59	MH-57a	59	0.11						0.10	5.00	0.00	5.00	7.00	0.71					SUMP		
Surface	I-59A	P/O 61	0.06	0.81	0.05	0.06	5.00	0.00	5.00	7.00	8.00	0.39						SUMP			
I-59A	MH-57A	P/O 61	0.06						0.06	5.00	0.00	5.00	7.00	0.39					SUMP		
Surface	I-57A	MH-57	59,P/O 61	0.17					0.16	5.00	0.39	5.39	6.96	1.09					SUMP		
Surface	I-61	P/O 61	0.21	0.81	0.17	0.19	5.00	0.00	5.00	7.00	8.00	1.36						SUMP			
I-61	MH-57	61	0.21						0.19	5.00	0.00	5.00	7.00	1.36					SUMP		
MH-57	TRENCH	59,61	0.38						0.35	5.39	0.62	6.01	6.86	2.39					SUMP		
Surface	I-31	31	0.20	0.81	0.16	0.19	5.00	0.00	5.00	7.00	8.00	1.30						SUMP			
Ex I-31	Ex MH-11	31	0.20						0.19	5.00	0.00	5.00	7.00	1.30					SUMP		
Surface	Ex I-45	45	0.38	0.81	0.31	0.35	5.00	0.00	5.00	7.00	8.00	2.46						SUMP			
Ex I-45	Ex H/W-44	45	0.38						0.35	5.00	0.33	5.33	6.96	2.44					SUMP		
Surface	I-55	55	0.23	0.81	0.15	0.21	5.00	0.00	5.00	7.00	8.00	1.49						SUMP			
I-55	TRENCH	55	0.23						0.21	5.00	0.00	5.00	7.00	1.49					SUMP		
Surface	I-54	54	0.23	0.81	0.19	0.21	5.00	0.00	5.00	7.00	8.00	1.49						SUMP			
I-54	TRENCH	54	0.23						0.21	5.00	0.00	5.00	7.00	1.49					SUMP		
Surface	I-52	52	0.18	0.81	0.15	0.17	5.00	0.00	5.00	7.00	8.00	1.17						SUMP			
I-52	TRENCH	52	0.18						0.17	5.00	0.00	5.00	7.00	1.17					SUMP		
Surface	I-51	51	0.09	0.81	0.07	0.08	5.00	0.00	5.00	7.00	8.00	0.58						SUMP			
I-51	Ex-MH-3	51	0.09						0.08	5.00	0.00	5.00	7.00	0.58					SUMP		
Surface	I-66	66	0.22	0.81	0.18	0.20	5.00	0.00	5.00	7.00	8.00	1.43						SUMP			
I-66	TRENCH	66	0.22						0.20	5.00	0.00	5.00	7.00	1.43					SUMP		
Surface	EW-62	62	11.65	0.39	4.34	5.20			13.70	0.00	13.70	5.55	28.85						SUMP		
EW-62	MH-63	62	11.65						5.20	13.70	0.00	13.70	5.55	28.85					SUMP		
MH-63	MH-64	62	11.65						5.20	13.70	0.00	13.70	5.55	28.85					SUMP		
Surface	I-65	65	0.22	0.81	0.18	0.20	5.00	0.00	5.00	7.00	8.00	1.43						SUMP			
I-65	MH-64	65	0.22						0.20	5.00	0.00	5.00	7.00	1.43					SUMP		
MH-64	TRENCH	65,62	11.87						5.40	13.70	0.15	13.85	5.55	29.98					SUMP		

## POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS

DEVELOPMENT:  
LOCATION:  
STORM FREQUENCIES:  
JOB NO.:

BAY VILLAGE  
CITY OF ANNAPOLIS  
10 YEAR  
04-1096

DATE: 12/15/2015  
SHEET: 1 OF 4  
COMPUTED BY: JK C  
CHECKED BY: T L S

LOCATION	AREA	ACRES	COEF.	CA	SUM CA	TIME CONC. MIN		Q=CIA C.F.S.	PIPE	N	SLOPE	VEL.	LEN.	DT	REMARKS				
						INLET	DRAIN												
FROM	TO	SUB	TOTAL	"C"															
Surface	I-42	42	0.33	0.81	0.27	0.31	5.00	0.00	5.00	7.00	8.00	2.14			SUMP				
I-42	MH-41	42	0.33				0.31	5.00	0.00	5.00	7.00	2.14	12	RCP	0.013	0.361	2.72	61.8	0.38
MH-41	MH-40	42	0.33				0.31	5.00	0.38	5.38	6.95	2.12	12	RCP	0.013	0.355	2.70	37.6	0.23
Surface	I-43	43	0.41	0.81	0.33	0.36	5.00	0.00	5.00	7.00	8.00	2.66							
I-43	MH-40	43	0.41				0.38	5.00	0.00	5.00	7.00	2.66	15	RCCP	0.013	0.169	2.17	10.5	0.08
MH-40	MH-12	42,43	0.74				0.69	5.38	0.23	5.61	6.90	4.73	15	RCCP	0.013	0.536	3.85	10.5	0.05
Surface	I-39	39	0.02	0.81	0.02		5.00	0.00	5.00	7.00	8.00	0.13							
ROOF	I-39	RD2	0.10	0.20		0.02	5.00	0.00	5.00	7.00	8.00	0.14	8	PVC	0.012	0.011	0.40	9	0.37
I-39	MH-12	39, RD2	0.12			0.04	5.00	0.37	5.37	6.95		0.27	12	RCCP	0.013	0.006	0.34	50.9	2.49
Surface	EXI-13	60	6.79	0.81	5.50	6.29	13.70	0.00	13.70	5.55	6.35	34.92							
EXI-13	MH-56A	60	6.79				6.29	13.70	0.00	13.70	5.55	34.92	42	RCP	0.013	0.12	3.6	21.00	0.10
Surface	I-56	56	0.15	0.81	0.12	0.14	5.00	0.00	5.00	7.00	8.00	0.97							
I-56	MH-56A	56	0.15				0.14	5.00	0.00	5.00	7.00	0.97	12	ADS	0.012	0.06	1.2	7.50	0.10
MH-56A	MH-12	56,60	6.94				6.43	13.70	0.10	13.80	5.55	35.70	42	RCP	0.013	0.13	3.7	42.00	0.19
MH-12	MH-11A	56,60, 39,42,43,R D2	7.80				7.16	13.80	0.19	13.98	5.50	39.35	36	RCCP	0.012	0.297	5.57	76.55	0.23
Surface	I36A	36A	0.08	0.81	0.06	0.07	5.00	0.00	5.00	7.00	8.00	0.52							
I36A	I-36	36A	0.08			0.07	5.00	0.00	5.00	7.00	8.00	0.52	8	PVC	0.012	0.157	1.49	65.1	0.73
Surface	I36	36	0.28	0.81	0.23	0.26	5.00	0.00	5.00	7.00	8.00	1.81							
I36	MH-35	36A,36	0.36				0.33	5.00	0.73	5.73	6.85	2.28	12	ADS	0.012	0.350	2.91	43.8	0.25
MH-35	I-34	36A,36	0.36				0.33	5.73	0.25	5.98	6.80	2.27	12	ADS	0.012	0.345	2.89	51.1	0.30
Surface	I-34	34	0.18	0.81	0.15		5.00	0.00	5.00	7.00									

Note: "C" values are taken from the Anne Arundel County Storm Drain Design Manual Appendix C - Commercial Use Slopes 2-7% (0.80)

**POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS**

DEVELOPMENT:  
LOCATION:  
STORM FREQUENCIES:  
JOB NO.:

BAY VILLAGE  
CITY OF ANNAPOLIS  
10 YEAR  
04-1096

DATE: 12/15/2015  
SHEET: 2 OF 4  
COMPUTED BY: JKC  
CHECKED BY: TLS

20 YEAR (ALL SUMPS)

LOCATION	AREA	ACRES		COEF	CA	SUM CA	TIME CONC. MIN	INTEN.	PIPE			DT	REMARKS		
		SUB	TOTAL						*C <sub>w</sub>	%*	INLET	DRAIN	TOTAL		
Surface	I-34A	34A	0.07	0.81	0.06	5.00	0.00	5.00	7.00	0.40					
I-34A	I-34	34A	0.07			0.06	5.00	0.00	5.00	7.00	0.40	8 PVC	0.012	0.092 1.14 11.15 0.16	
I-34	MH-32	34,34A,36,36A	0.61			0.54	5.98	0.30	6.28	6.75	3.62	15 RCCP	0.013	0.314 2.95 47.7 0.27	
Surface	I-38	38	0.05	0.81	0.04	0.05	5.00	0.00	5.00	7.00	0.00				
I-38	MH-32	38	0.05			0.05	5.00	0.16	5.16	7.00	0.32	12 ADS	0.012	0.007 0.41 18.40 0.74	
Surface	I-37	37	0.14	0.81	0.71	0.13	5.00	0.00	5.00	7.00	0.00				
I-37	MH-32	37	0.14			0.13	5.16	0.00	5.16	7.00	0.91	12 ADS	0.012	0.055 1.16 37.60 0.54	
MH-32	MH-11A	34,36,36A, 13,14,34,3 6,36A,37,3 8,39,42,43 ,OFF1,RD	0.80			0.71	6.28	0.27	6.55	6.70	4.77	15 RCCP	0.013	0.545 3.89 70.6 0.30	
MH-11A	MH-11	2	8.60				7.87	13.98	0.23	14.21	5.45	42.87	36 RCCP	0.013	0.414 6.07 27.6 0.08
Surface	I-30	30	0.23	0.81	0.19	0.21	5.00	0.00	5.00	7.00	0.00				
I-30	MH-11	30	0.23			0.21	5.00	0.00	5.00	7.00	1.49	12 RCCP	0.013	0.175 1.90 27.3 0.24	
Surface	I-31	31	0.20	0.81	0.16	0.19	5.00	0.00	5.00	7.00	0.00				
I-31	MH-11	31	0.20			0.19	5.00	0.00	5.00	7.00	1.30	12 RCCP	0.013	0.132 1.65 11.8 0.12	
MH-11	MH-10						8.26	14.21	0.08	14.29	5.45	45.04	36 RCCP	0.013	0.457 6.38 182.3 0.48
ROOF	MH-28	RD1	0.31	0.90		0.28	5.00	0.00	5.00	7.00	1.95	8 PVC	0.012	2.228 5.60 2 0.01	
MH-28	MH-27	RD1	0.31	0.90		0.28	5.00	0.00	5.00	7.00	1.95	12 RCCP	0.013	0.301 2.49 23.1 0.15	
MH-27	MH-26	RD1	0.31	0.90		0.28	5.00	0.00	5.00	7.00	1.95	12 RCCP	0.013	0.301 2.49 90.6 0.61	
FUT	I-29	FUT2	0.46	0.81	0.37	5.00	0.00	5.00	7.00		2.61	15 RCCP	0.013	0.163 2.13 39.6 0.31	
SURFACE	I-29	29	0.47	0.81	0.38	0.44	5.00	0.00	5.00	7.00	0.05				
I-29	MH-26	29,FUT2	0.93			0.81	5.00	0.31	5.31	6.95	5.61	18 RCCP	0.012	0.244 3.18 21.5 0.11	

## POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS

DEVELOPMENT:  
LOCATION:  
STORM FREQUENCIES:  
JOB NO.:

BAY VILLAGE  
CITY OF ANNAPOLIS  
10 YEAR  
04-1096

DATE: 12/15/2015  
SHEET: 3 OF 4  
COMPUTED BY: JK C  
CHECKED BY: T L S

20 YEAR (ALL SUMPS)

LOCATION	FROM	TO	AREA	ACRES	COEF.	CA	SUM CA	TIME CONC. MIN	INTEN.	Q=CIA C.F.S.	PIPE			REMARKS						
											TOTAL	"F"	INLET	DRAIN						
MH-26	MH-10	RD1,FUT2,29		1.24				1.09	5.00	0.61	5.61	6.90	7.50	18	RCCP	0.013	0.510	4.25	83.80	0.33
MH-10	MH-9	13,14,29,3 0,31,34,36 .36A,37,38 .39,42,43, OFF1, RD1 ,RD2, FUT 2		10.27				9.35	14.29	0.48	14.77	5.40	50.50	42	RCCP	0.013	0.252	5.25	244.9	0.78
Surface	I-21	21	0.09	0.81	0.07	0.08	5.00	0.00	5.00	7.00	8.00	0.58								SUMP
I-21	I-20	21	0.09			0.08	5.00	0.00	5.00	7.00	8.00	0.58	12	ADS	0.012	0.023	0.74	91.6	2.05	
Surface	I-20	20	0.07	0.81	0.06		5.00	0.00	5.00	7.00	8.00	0.45								SUMP
I-20	MH-19	20,21	0.16		0.15	5.00	0.00	5.00	7.00	1.04	12	ADS	0.012	0.072	1.32	29.3	0.37			
Surface	I-24	24	0.26	0.81	0.21	0.24	5.00	0.00	5.00	7.00	8.00	1.68								SUMP
I-24	MH-19	24	0.26	0.81		0.24	5.00	0.00	5.00	7.00	1.68	12	ADS	0.012	0.191	2.15	60.8	0.47		
MH-19	MH-18	20,21,24	0.42		0.39	5.00	0.47	5.47	6.90	2.68	12	ADS	0.012	0.484	3.42	61.80	0.30			
SURFACE	I-23	23	0.10	0.81	0.08	0.09	5.00	0.00	5.00	7.00	8.00	0.65								SUMP
I-23	MH-18	23	0.10			0.09	5.00	0.00	5.00	7.00	8.00	0.65	8	PVC	0.012	0.245	1.86	13.6	0.12	
MH-18	MH-17	20,21,23,24	0.52		0.48	5.47	0.30	5.77	6.85	3.30	15	ADS	0.012	0.222	2.69	61.50	0.38			
SURFACE	I-22	22	0.02	0.81	0.02	0.02	5.00	0.00	5.00	7.00	8.00	0.13								SUMP
I-22	MH-17	22	0.02			0.02	5.00	0.00	5.00	7.00	8.00	0.13	8	PVC	0.012	0.010	0.37	15.2	0.68	
MH-17	MH-9	20,21,22,23,24	0.54		0.50	5.77	0.38	6.15	6.80	3.40	15	ADS	0.012	0.236	2.77	92.00	0.55			

**POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS**

DEVELOPMENT:  
LOCATION:  
STORM FREQUENCIES:  
JOB NO.:

BAY VILLAGE  
CITY OF ANNAPOLIS  
10 YEAR  
04-1096

DATE: 12/15/2015  
SHEET: 4 OF 4  
COMPUTED BY: JKC  
CHECKED BY: TLS

LOCATION	AREA	ACRES		COEF	CA	SUM CA	TIME CONC, MIN		INTEN. "f"	Q=CIA C.F.S.	PIPE			REMARKS				
		SUB	TOTAL				"C"	INLET			SIZE	Type	N	SLOPE	VEL.	LEN.	DT	
		13,14,20- 24,29,30,3 1,34,36,36 A,37,38,39 .42,43,OF F1, RD1,R D2,FUT2	10.81															
MH-9	MH-8																	
Surface	I-51	51	0.09	0.81	0.07	0.08		5.00	0.00	5.00	7.00	8.00	0.58			SUMP		
I-51	Ex-MH-8	51	0.09			0.08	5.00	0.00	5.00	7.00	0.58	12	ADS	0.013	0.03	0.7	40.05	0.90
		13,14,20- 24,29,30,3 1,34,36,36 A,37,38,39 .42,43,OF F1, RD1,R D2,FUT2, FUT4,51	10.90															
MH-8	MH-7																	
Surface	I-16	16	0.32	0.81	0.26	0.30		5.00	0.00	5.00	7.00	8.00	2.07			SUMP		
I-16	I-15	16	0.32			0.30	5.00	0.00	5.00	7.00	0.07	12	ADS	0.012	0.289	2.64	70.5	0.44
Surface	I-45	45	0.38	0.81	0.31	0.35		5.00	0.00	5.00	7.00	8.00	2.46			SUMP		
I-45	HW-44/I-15	45	0.38			0.35	5.00	0.00	5.00	7.00	2.46	12	ADS	0.012	0.407	3.14	137.5	0.73
Surface	I-15	15	0.07	0.81	0.06			5.00	0.00	5.00	7.00	8.00	0.45			SUMP		
I-15	MH-7	15,16,45	0.77			0.71	5.00	0.73	5.73	6.85	4.88	15	ADS	0.012	0.487	3.98	47.6	0.20
		13,16,20- 24,29,30,3 1,34,36,36 A,37,38,39 .42,43,45, OFF1, RD1, RD2,FUT 2,FUT4	11.67															
MH-7	HW-6																	

## POST-DEVELOPMENT STORM DRAIN FLOW TABULATIONS

BAY VILLAGE OFF SITE STORM DRAIN  
ANNE ARUNDEL COUNTY  
10 YEAR      20 YE  
03-1005

DATE SHEET COMPUTED BY  
CHECKED BY

12/3/2015  
1  
JC

LOCATION	FROM	TO	AREA	ACRES	COEFF.	CA	SUM CA	TIME CONC, MIN	INTEN	PIPE			REMARKS			
										SIZE	Type	N	SLOPE			
Per attached TR-20 computations																
Riser #5	MH#4									22.10	RCCP	0.013	0.51	5.6	55.3	0.17
MH#4	MH#3									22.10	RCCP	0.013	0.51	5.6	246	0.74
MH#3	MH#2									22.10	RCCP	0.013	0.51	5.6	193	0.58
MH#2	MH#1									22.10	RCCP	0.013	0.51	5.6	128	0.38
Per attached TR-20 Computations																
I-25	MH#1									14.50	RCCP	0.013	0.22	3.6	11	0.05
Per attached TR-20 Computations																
MH#1	EX.MH-22									33.40	RCCP	0.013	1.16	8.4	66	0.13
EX MH-22	EX ES-5									33.40	RCCP	0.013	1.16	8.4	347	0.69

# **Appendix G**

# **Asbuilt Plans**